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A Revision of the Genus Athysanella and Some Related Genera (Homoptera-Cicadellidae)

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ABSTRACT: The following genera of leaf hoppers in America north of Mexico are revised: *Athysanella, Gladionura, Amphipyga, Pectinapyga, Gillettiella* and *Doratura*. Keys to the genera, subgenera and species are included, as well as illustrations of male genitalia and the last ventral segment of the females. Discusses 82 species, of which 65 are new. The new categories described and nomenclatorial changes made are as follows: new synonymy; *Amphipyga* Osb. (= *Pectinapyga* Osb.); *Athysanella* (*Gladionura*) *sinuata* Osb. (= *Gladionura abbreviata* Osb.); *Athysanella gardenia* Osb. (= *Gladionura frigida* Osb.); *Athysanella robusta* Bk. (= *Athysanella montana* Osb.); *Athysanella* (*Amphipyga*) *aridella Osb.* (= *Amphipyga californica* Osb.); *Athysanella* (*Amphipyga*) *texana* Osb. (= *Gladionura aridicola* Osb.); *Athysanella* (*Amphipyga*) *attenuata* Bk. (= *Amphipyga alta* Osb.) (= *Athysanella extrusa* Osb.); *Athysanella* (*Amphipyga*) *occidentalis* Bk. (= *Athysanella minuta* Bk.); *Athysanella* (*Gladionura*) *curtipennis* Gill. and Bk. (= *Gladionura extensa* Osb.); *Gillettiella labiata* (Gill.) (= *Deltocephalus labiata* var. *rufus* Gill.); new subgenera; *Brachydella* (type, *Brachydella abdominalis* n. sp.; *Pedumella* (type, *Pedumella spatulata* n. sp.): *Gladionura* and *Amphipyga* are reduced to subgenera of *Athysanella*: new species described: *Athysanella fredonia, Athysanella plana, Athysanella incerta, Athysanella parca, Athysanella laeta, Athysanella tenera, Athysanella aspersa, Athysanella globosa, Athysanella foeda, Athysanella kanabana, Athysanella salsa, Athysanella rostrata, Athysanella supina, Athysanella bifida, Athysanella planata, Athysanella* (*Amphipyga*) *ardua, Athysanella* (*Amphipyga*) *playana, Athysanella* (*Amphipyga*) *rubicunda, Athysanella* (*Amphipyga*) *skullana, Athysanella* (*Amphipyga*) *triodana, Athysanella* (*Amphipyga*) *nimbata, Athysanella* (*Amphipyga*) *anzana, Athysanella* (*Amphipyga*) *obesa, Athysanella* (*Amphipyga*) *minor, Athysanella* (*Amphipyga*) *minor* var. *major, Athysanella* (*Amphipyga*) *turgida, Athysanella* (*Amphipyga*) *hamata, Athysanella* (*Amphipyga*) *wilburi, Athysanella* (*Amphipyga*) *modesta, Athysanella* (*Amphipyga*) *kansana, Athysanella* (*Gladionura*) *dubia, Athysanella* (*Gladionura*) *truncata, Athysanella* (*Gladionura*) *blanda, Athysanella* (*Gladionura*) *blanda* var. *vana, Athysanella* (*Gladionura*) *callida, Athysanella* (*Gladionura*) *uncinata, Athysanella* (*Gladionura*) *casa, Athysanella* (*Gladionura*) *alsa, Athysanella* (*Gladionura*) *rata, Athysanella* (*Gladionura*) *libera, Athysanella* (*Gladionura*) *molesta, Athysanella* (*Gladio-*

nura) adunca, Athysanella (Gladionura) sinuata var. *lobata, Athysanella (Gladionura) lunata, Athysanella (Gladionura) concava, Athysanella (Gladionura) clavata, Athysanella (Gladionura) directa, Athysanella (Gladionura) nigriventralis, Athysanella (Gladionura) dentata, Athysanella (Gladionura) curvata, Athysanella (Gladionura) contracta, Athysanella (Gladionura) sagittata, Athysanella (Gladionura) arcana, Athysanella (Gladionura) diversa, Athysanella (Brachydella) abominalis, Athysanella (Pedumella) spatulata, Gillettiella fasciata.*

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THIS paper deals with the species of the following genera of leaf hoppers in North America north of Mexico: Athysanella Bk.; Gladionura Osb.; Amphipyga Osb.; Pectinapyga Osb.; Gillettiella Osb.; Doratura Shlb. (in America); Brachydella n. sub. g. and Pedumella n. sub. g. Gladionura and Amphipyga are reduced to subgenera of Athysanella, Pectinapyga is placed as a synonym of Amphipyga, and Doratura is reported for the first time in this country.

The revision was begun several years ago because of the inability to classify satisfactorily the great amount of material then in the Snow Entomological Collection and the private collection of the senior author. Doctor Ball's serious illness in February, 1937, very materially handicapped the progress of the work. However, in spite of this misfortune it seemed best to go ahead and finish the paper, omitting all host-plant records and life-history material, in the hope that Doctor Ball will again be able to go ahead with that portion of the study at some future date.

Many thousands of specimens have been examined. Aside from all the material that was in the collections of the country, the Biological Survey of the University of Kansas made this group a "special order of business" in the summers of 1935, 1936 and 1937, visiting especially those regions known to be most suitable to these insects. Special effort was made to obtain better series of some of the forms represented by too few specimens. As a result we have been able to study a great many individuals of most of the species. We have also been fortunate in being able to study all the available type material.

ACKNOWLEDGMENTS

We desire to express our appreciation to all those individuals and institutions who have so generously aided us with loans of specimens. We are especially indebted to P. W. Oman of the United States National Museum for much helpful advice and comparisons of type material and to Dr. J. N. Knull of Ohio State University for the privilege of studying the Osborn types.

DISTRIBUTION

The members of this group of leaf hoppers are pretty well scattered over North America, but since they feed entirely upon grasses and the most of them upon the so-called "short-grasses," we find a concentration of species in the desert regions of the Southwest. Arizona, New Mexico, Colorado and Kansas have yielded by far the most of our forms. Some of the species seem to have a wide dis-

tribution, while others are quite restricted. This can probably be correlated with food-plant distribution.

TECHNIQUE

This study is based largely on male external and internal genitalia. Slide mounts are made by removing the abdomen of the male, placing it in ten percent caustic for a short time (1-2 minutes) until cleared, transferring to water, then to a drop of glycerine, where the pygofers are removed from the plates by splitting the body wall along the sides and rupturing it about the base of the aedeagus. These two portions are then mounted in diaphane inside down on glass slides. Cover slips are pressed uniformly in place in order to give each structure as nearly the same view as possible. Negative prints on photostat paper have been made from these slides by projection and are used in our plates.

DIAGNOSTIC CHARACTERS

The head-shape and the type of male genitalia are used for generic separation. The presence or absence of a spine on the hind tibia, together with the shape of the pygofer of the male, forms the basis for subgeneric distinction and the shape of the male plates, styles, aedeagi, and the last ventral segment of the females plus the usual presence or absence of round, black spots on the margin of the vertex, forms the basis for the separation of species. Genitalic characters have proven much more stable than vertexal or color.

Each species usually has both a short- and a long-winged form, especially in the female, the short-winged individuals predominating During our study of thousands of individuals we have been impressed by the numerous examples of freaks of both sexes; that is, specimens in which both internal and external parts of the genitalia are only partially developed. As to what may have caused this abnormality we have no suggestions to make. It has not been uncommon to find one freak in every twenty-five specimens. It is entirely possible, therefore, as has occurred, to have one of these undeveloped individuals described as the type of a species.

TAXONOMIC POSITION

This group of leaf hoppers belongs to the subfamily Jassinae, which is distinguished from other subfamilies of the Cicadellidae by having ocelli on or near the margin of the vertex. They are usually short winged with indistinct venation and the females usually have long, sharp ovipositors.

KEY TO GENERA

1. Vertex margin between ocelli thick, rounding to front, or if vertex margin is sharp with a spur on apex of hind tibia 2
   Vertex margin between ocelli foliaceous; no spur on apex of hind tibia of male ..... *Doratura*, p. 69
2. Head long, cone-shaped ..... *Gillettiella*, p. 67
   Head broadly angled, not cone-shaped ..... *Athysanella*, p. 9

THE GENUS ATHYSANELLA

C. F. Baker described the genus Athysanella in 1898 (Psyche, Vol. VIII, p. 185), designating *A. magdalena* Bk. type. In 1930 (Ann. Ent. Soc. Am., Dec., pp. 687-721) H. Osborn, in a revision of the genus, described four new genera: Gillettiella, Pectinapyga, Amphipyga, and Gladionura. After a study of the many thousands of specimens the authors were convinced that a truer picture of relationships would be shown by retaining Gilletiella, placing Pectinapyga as a synonym of Ahphipyga, and reducing Gladionura and Amphipyga to subgenera of Athysanella. To complete this picture it was necessary to describe two more subgenera: Brachydella and Pedumella.

These leaf hoppers are usually small, less than 6.5 mm. in length, with vertex angled to rounded, usually brachypterous, some long winged forms present in each species, venation indistinct, ovipositor of female usually long and sharp and male genitalia usually large and of a more or less open type.

KEY TO SUBGENERA OF ATHYSANELLA

1. Male pygofer ending in a hook or long narrowed process at outer ventral corner 2
   Male pygofer broadly rounded 3
2. Hind tibia of male with large spur at apex 4
   Hind tibia of male without large spur at apex ..... *Pedumella*, p. 65
3. Hind tibia of male with spur at apex ..... *Athysanella*, p. 9
   Hind tibia of male without spur at apex ..... *Amphipyga*, p. 25
4. Vertex margin from eye to eye broadly rounded, very sharp, disc concave ..... *Brachydella*, p. 64
   Vertex margin from eye to eye more or less angular, never extremely sharp ..... *Gladionura*, p. 42

The Subgenus ATHYSANELLA Bk.

Athysanella-like leaf hoppers, the males of which have rounded pygofers and spurs on apex of hind tibia. Type of the genus *A. magdalena* Bk.

KEY TO THE SPECIES OF ATHYSANELLA

1. Usually with two or three round, black spots on margin of vertex 2
   Usually without round, black spots on margin of vertex 13
2. (1) Outer third of style bifid 4
   Outer third of style not bifid 3
3. (2) Styles protruding beyond plates ..... *gardenia*, p. 11
   Styles about as long as plates ..... *globosa*, p. 18

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Tip of aedeagus sharp on dorsal margin; last ventral segment of female with median lobe half as long as laterals.....*incongrua*, p. 13
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Aedeagus with hook at apex barely curved; dorsal point with sides almost parallel, sickle-shaped; middle lobe of last ventral segment of female longer than laterals .....*rostrata*, p. 21
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Ventral point of style viewed caudally with lateral flanges..... 20
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22. (21) In ventral view outer margin of dorsal point of style sharply sloped toward inner margin at apex.....*planata*, p. 24
In ventral view outer margin of dorsal point of style not sloped toward inner margin at apex .....*yumana*, p. 25

1.* *Athysanella gardenia* Osb.

Athysanella gardenia Osborn, Herbert, Annals Ent. Soc. Am., XXIII, p. 701, 1930.
Gladionura frigida Osborn, Herbert, Annals Ent. Soc. Am., XXIII, p. 709, 1930.

This is a common Colorado species characterized by the long protruding styles, and widely separated, triangular plates. Length: Male, 2.75 mm.; female, 3.75 mm.

Vertex flat, margins rounded; style protruding; spur on hind tibia of male extending slightly beyond middle of first tarsal segment.

Color cinereous; vertex with two large black spots on margin and a smaller spot at apex; elytra dusky, with veins lighter; dorsum of abdomen with usual dark marks.

Genitalia. Pygofer broadly rounded; valve triangular; plates about as wide at base as valve, sinuately narrowed to rounded apices, mesally widely separated, apices with distinct tooth just laterad of middle. Styles long with one margin almost straight, other curved, strongly protruding; aedeagus in lateral view slightly curved dorsally, slightly widened apically, apex dorsally convex. Last ventral segment of female with lateral margins greatly extended, posterior margin deeply excavated with small median tooth.

The holotype and allotype were not designated in the original description nor were they marked in any collection. A lectoholotype (No. 43183) male, and female lectoallotype (No. 43183), Garden of the Gods, Colorado, Webster No. 7104; in the United States National Museum are here designated.

2. *Athysanella magdalena* Baker

Athysanella magdalena Baker, C. F., Psyche, March, 1898, p. 185.

This species, selected by Baker as the type of the genus, is one of the commonest in the Rocky Mountain region. Of small size, it may be recognized by the very long, sharp-pointed plates of the male and bifurcate style and the trilobed posterior margin of the last ventral segment of the female, with the median lobe wider and longer than the laterals. Length: Male, 2.5 mm.; female, 3.5 mm.

Vertex flat, margins rounded; style usually visible; spur on hind tibia of male about two-thirds as long as first tarsal segment.

Genitalia. Male pygofer broadly rounded, almost truncate at apex; valve obtusely rounded; plates as broad as valve at base, very long, tapering to sharp apices; styles long, enlarging toward apex, humped on inner margin, apex bifid. Aedeagus of medium length, slightly curved dorsally, ventral margin lightly serrate. Last

* Numeral preceding each species refers to number on plates.

ventral segment of female about twice as long as preceding, posterior margin deeply trilobed, middle lobe much wider and longer than laterals.

Lectoholotype female, Magdalena Mts., New Mexico, August, 1894, F. H. Snow, and lectoallotype male, Forrester's Ranch, Laramie county, Colorado, August 3, 1896 (No. 2013 of Baker), are here designated. Types in United States National Museum.

Specimens are at hand from Colorado, New Mexico, Arizona and Utah.

3. *Athysanella fredonia* n. sp.

Resembling *incongrua* Bk., but lateral margins of last ventral segment of female heavy, not longer than middle portion, styles of males not bifid, and aedeagus with ventral margin serrate, with apex hooked. Length: Male, 3 mm.; female, 4.5 mm.

Vertex flat, margins rounded; styles of male usually visible; spur on hind tibia of male long, almost as long as first tarsal segment.

Color cinereous to tawny, with darker markings; vertex with two black spots on margin and a smaller one at apex from which extends two short dashes; disc with inverted L-shaped marks; pronotum more or less infuscated; elytra dark with light veins; dorsoum of abdomen with usual dark spots.

Genitalia. Pygofer of male almost rectangular, lateral margins slightly converging, apex truncate; valve angular with rounded apex; plates narrower than valve at base, outer margin slightly converging to bluntly rounded apex; styles with apices greatly enlarged, not bifid, end view shows a typical out-and-in curve on inner portion; aedeagus in lateral view large, widest near outer third, ventral margin serrate, apex hooked. Last ventral segment of female about as long as preceding, posterior margin angularly excavated from slightly rounded lateral margins to a rather broad, rounded median tooth.

Holotype male, allotype female, and 3 males and 2 females, Fredonia, Ariz., August 6, 1930, E. D. Ball; paratypes as follows: numerous specimens, both sexes, Grand Junction, Colo., August 16, 1936, White's City, N. Mex., July 17, 1936, Flagstaff, Ariz., July 27, 1936., R. H. Beamer; 20 females and 17 males, Kanab, Utah, E. D. Ball; 7 males and 8 females, Grand Canyon, Ariz., E. D. Ball; other specimens are at hand from the following localities: Las Animas, Colo.; Garden of Gods, Colo.; St. Johns, Ariz.; Santa Fe, N. Mex.; Pearce, Ariz.; Mustang Mts., Ariz.; Springer, N. Mex.; Hartford, N. Mex.; Williams, Ariz.; Ash Fork, Ariz.; Westwater,

Utah; Parowan, Utah; Painted Desert, Ariz.; Glenn Oaks, Ariz.; Lupton, Ariz.; Huachuca Mts., Ariz.

Types and paratypes in collection of E. D. Ball, paratypes in Snow Entomological Collection and United States National Museum.

4. *Athysanella plana* n. sp.

Resembling *aspera,* but female with last ventral segment with lateral margins longer and more slender and median excavation deeper, and styles of male with apex broad and but slightly curved from lateral view, outside of inner projection sloped to meet inner margin in sharp line. Length: Male, 3 mm.; female, 5 mm.

Vertex flat, margins rounded; styles usually visible; spur on hind tibia of male almost as long as first tarsal segment.

Color tawny, with darker markings; vertex with two black spots on margin and a smaller spot at apex, with two backward projecting dashes; semblance of boxlike marks on disc; elytra dark with light veins; dorsum of abdomen with usual dark markings.

Genitalia. Pygofer of male broadly rounded; valve about as long as preceding; plates broader than valve at base, sharply converging on outer margin to truncate apices; styles with large fingerlike inner projection, in lateral view outer margin but slightly and very evenly curved, inner prong with its outside sharply sloped to inner at apex; aedeagus in lateral view constricted at base, ending in blunt hook. Last ventral segment of female at least twice as long as preceding, lateral margins prolonged into slender points, posterior margin deeply excavated with a definite median tooth not more than a third as long as lateral wings.

Holotype male, allotype female, and numerous paratypes, Califa, Cal., June 12, 1935, P. W. Oman; 2 male and 1 female paratypes, Visalia, Cal., June 11, 1909, E. D. Ball. Types and paratypes in U. S. National Museum, paratypes in collection of E. D. Ball.

5. *Athysanella incongrua* Baker

Athysanella incongrua Baker, C. F., Psyche, March, 1898, p. 188.

Resembling *terebrans,* but may be separated by the angular apex of aedeagus, by the parallel-margined inner process of style, and by the less deeply excavated posterior margin of the last ventral segment of the female, the lateral projections less than twice the length of median tooth. Length: Male, 3.75 mm.; female, 4.75 mm. Vertex flat to rounded, margins rounding; styles usually visible; spur on hind tibia of male usually slightly more than half as long as first tarsal segment.

Color cinereous to tawny, marked with darker; vertex usually with three black spots on margin; pair of dark triangles back of median spot often present; elytra often dark; veins usually lighter; dorsum of abdomen with usual spotting.

Genitalia. Pygofer broadly rounded; valve obtusely rounded; plates as broad as valve at base, scarcely narrowed to broadly rounded apices diverging mesally; style at apex broadly U-shaped, inner fork parallel-sided, with apex rounded. Aedeagus in lateral view gradually widening to avicephalic apex. Last ventral segment of female with lateral margins extended, posterior margin excavated with a broad median tooth. Lateral margins scarcely twice as long as median tooth.

Lectoholotype male, Fort Collins, Colo., July 21, C. F. Baker, in United States National Museum. Allotype female, Peyton, Colo., August 19, 1936, R. H. Beamer, in Snow Entomological Collection. Specimens have been examined from Kansas, Nebraska, Oklahoma, Colorado, and New Mexico.

6. *Athysanella terebrans* (Gill. & Baker)

Euttetix terebrans Gillette and Baker, Hemip. Colo., p. 102, 1895.

Resembling *incongrua* Baker, but end of aedeagus blunt, the inner fork of style sharp, and much deeper excavation of the posterior margin of the last ventral segment of the female. Length: Male, 3 mm.; female, 5 mm.

Vertex flat to excavated; margins rounded; style usually exposed; spur on hind tibia of male not more than half as long as first tarsal segment.

Color cinereous, with darker markings; vertex with two black spots on margin and a smaller spot at apex, with a pair of dots back of apex and semblance of boxlike marks on disc; elytra with veins lighter, with dusky stripes; abdomen spotted, as usual.

Genitalia. Pygofer broadly rounded; valve obtusely rounded; plates as broad as valve at base, converging to broadly rounded apices, diverging on mesal line. Style U-Shaped at apex, inner process narrowing to apex, not broadly rounded as in *Athysanella incongrua* Baker. Aedeagus in lateral view gradually increasing in size toward tip, dorsal and ventral margins more or less serrate, apex rounded. Female last ventral segment deeply excavated on posterior margin, lateral extensions at least twice as long as median notch.

Specimens have been studied from Colorado, Utah, Wyoming, and Nebraska. Allotype male, Wray, Colo., July 13, 1899. In Collec-

tion Colorado Agricultural College, Fort Collins, Colo. Holotype female, North Park, Colo., July 30 (Gillette), in United States National Museum.

7. *Athysanella incerta* n. sp.

Resembling *parca,* but may be separated by the deeper notch in the apex of style and by the almost complete circle made by the hook at apex of aedeagus. Length: Male, 3 mm.; female, 4.5 mm.

Vertex flat, margins medium; apices of styles usually visible; spur on hind tibia of male almost as long as first tarsal segment.

Color yellowish-green, vertex usually with three black spots; elytra semihyaline, veins often lighter; dorsum of abdomen with usual spots.

Genitalia. Pygofer broadly rounded, posterior margin almost truncate. Valve obtusely rounded. Plates about as wide as valve at base, almost touching on mesal margin, evenly narrowed to broadly rounded apices. Styles slender to much enlarged bifid apical third, two parts almost equally projecting. Aedeagus in lateral view curved slightly dorsally, sides almost parallel, enlarged slightly at apex, dorsal side cut away at apex, ventral corner produced into an almost circular hook. Posterior margin of last ventral segment of female with lateral angles broad and produced, mesal portion broadly produced about half as far as lateral angles.

Holotype male, allotype female, 16 male and 6 female paratypes, Lamar, Colo., August 20, 1936, R. H. Beamer; other paratypes, nine pairs from Las Animas, Colo., August 20, 1936, R. H. Beamer; 2 males, Wray, Colo., July 28, 1900; 5 males, Canyon, Colo., July 13, 1898; 15 pairs, Lusk, Wyo., July 21, 1935, P. W. Oman. Types and paratypes in Snow Collection, paratypes in United States National Museum and Colorado Agricultural College Collection.

8. *Athysanella parca* n. sp.

Resembling *salsa,* but with round, black spots on vertex, with plates of male much longer with round apices, with apex of style much heavier and finger process not projecting beyond apex, apex of aedeagus with about a half hook and last ventral segment of female with median lobe about as long as laterals. Length: Male, 3.25 mm., female, 4.25 mm.

Vertex flat, margins medium; apex of styles visible; spur on hind tibia of male almost as long as first tarsal segment.

Color yellowish-green, vertex with two black spots on margin with smaller spot at apex; veins of elytra sometimes lighter; usual spots on abdomen.

Genitalia. Pygofer broadly rounded, outer margin almost truncate. Valve obtusely angulate; plates narrower than valve at base, separated on mesal line, evenly narrowed to rounded apices. Styles with rather narrow shaft, outer third very much enlarged, shallowly bifid, finger process not reaching beyond apex of shaft. Aedeagus in lateral view almost parallel-sided, slightly enlarged at apex, dorsal corner of apex cut away, ventral corner ending in about a half hook. Last ventral segment of female with lateral angles of posterior margin produced into prominent lobes; median lobe heavier and almost as long as laterals, flanked on either side by semblance of lobe.

Holotype male, allotype female and numerous paratypes of both sexes, Belen, N. Mex., July 20, 1936, R. H. Beamer and D. R. Lindsay. Numerous other specimens are at hand from Roswell, N. Mex., July 16, 1936, same collectors.

9. *Athysanella laeta* n. sp.

Resembling *terebrans,* but much smaller, with longer inner points of styles, aedeagus sharp-pointed, and lateral margins of last ventral segment of female short as in *incongrua.* Length: Male, 3 mm.; female, 4 mm.

Vertex flat to concave, margins sharp; apex of style usually visible, spur on hind tibia of male about two-thirds as long as first tarsal segment.

Color cinereous to fulvous with darker markings; vertex usually with two black marks on margin and a smaller spot on apex; elytra darker or subhyaline, with veins lighter; abdomen with usual darker marks.

Genitalia. Pygofer with apices rounded; valve roundingly obtuse; plates at base about as wide as valve; styles bifid at apex, process at right angles to shaft long and narrow, reaching beyond apex of shaft; aedeagus in lateral view curved dorsally, gradually widening to sharp apex. Last ventral segment of female with lateral margins prominent, posterior margin deeply excavated, with a median tooth about half as long as lateral margins.

Holotype male, Huachuca Mts., Ariz., July 15, 1934; allotype female, same data except July 14; paratypes as follows: numerous specimens, Huachuca Mts., Ariz., September 5, 1936, E. D. Ball; 4 males and 4 females, same data as allotype, and one pair same data as holotype; 2 females, Mustang Mts., Ariz., August 22, 1935, R. H. Beamer. Other specimens at hand from Springer, N. Mex.

Types in Collection of E. D. Ball; paratypes in Snow Entomological Collection.

10. *Athysanella tenera* n. sp.

Resembling *foeda,* but much smaller, hardly half as large, vertex with round, black spot on lateral margin and last ventral segment of female with lateral projections broader, more rounded at apex, and outer margin excavated. Length: Male, 3 mm.; female, 4.25 mm.

Vertex flat, margins medium; apex of styles usually visible; spur on hind tibia of male, about two-thirds as long as first tarsal segment.

Color cinereous to stramineous, vertex with three small black spots on margin, veins of elytra lighter; spots on dorsum of abdomen about as usual.

Genitalia. Male pygofer almost rectangular with broadly rounded apex; valve slightly shorter than preceding segment, obtusely angulate; plates broader at base than valve, outer margin almost straight, inner margin rounded from slightly beyond apex of valve to practically truncate apices, angled toward outer margin; style enlarged on outer half, almost trifid at apex, inner process long and slender; portion next plate concave, angled with apex of plate margin; aedeagus in lateral view broadest at middle, quite narrowed at apex, ventral margin finely serrate. Last ventral segment of female slightly longer than preceding, lateral margins slightly excavated to long lateral processes, fairly broad with rounded apices, posterior margin deeply excavated to broad, slightly produced median portion.

Holotype male, allotype female, and numerous paratypes, Las Vegas, Nev., August 8, 1936; R. H. Beamer. Types in Snow Entomological Collection.

11. *Athysanella aspera* n. sp.

Resembling *terebrans,* but median tooth in last ventral segment of female less definite, dorsal prong of style projecting beyond outer, and aedeagus ending in a hook. Length: Male, 2.75 mm.; female, 4.25 mm.

Structure. Vertex about a right angle, flat, almost concave in male; hind tibia of male with spur almost as long as first tarsal segment.

General color cinereous, with darker markings; vertex usually with three black spots on margin; pronotum more or less flecked with dark; elytra with darker longitudinal stripes; abdomen about as usual.

Genitalia. Pygofer of male broadly rounded; valve about as long as preceding segment; plates broader than valve at base, short, sides converging slightly to truncate apices; styles with apices bifid, inner fork extending beyond outer; aedeagus in lateral view broadest at base, ending in slightly curved tip. Last ventral segment of female about twice as long as preceding, lateral margins greatly produced, posterior margin deeply excavated with more or less definite median tooth.

Holotype male, allotype female, 14 male and 11 female paratypes, Mojave, Cal., July 1, 1931, E. D. Ball; numerous paratypes, Lancaster, Cal., June 8, 1935, P. W. Oman. Types in collection of E. D. Ball and paratypes in collection of United States National Museum.

12. *Athysanella robusta* Baker

Athysanella robusta Baker, C. F., Psyche, March, 1898, p. 187.
Athysanella montana Osborn, Herbert, Annals Ent. Soc. Am., Vol. XXIII, 1930, p. 700.

A rather stout species easily separated by the long ribbonlike pygofer of the male, by the short triangular, widely separated plates and the long, toothed, ventral process of the aedeagus. Length: Male, 3 mm.; female, 4 mm.

Vertex slightly convex, margins rounded; only the apices of styles visible externally; spur on hind tibia of male very short, sometimes absent.

Color cinereous, often suffused with brown; elytra with veins lighter, abdomen with usual spots.

Genitalia. Male pygofer apically narrowed to about one-third median basal width, more or less rolled outward. Valve obtusely angled, much longer than wide; plates triangular, broadly separated medially, outer margin much longer. Aedeagus very slightly curved dorsally with ventral process almost as long as shaft, toothed on inner and outer margins. Style short, slightly protruding, tip rounded.

Due to an incorrect identification of Baker's *robusta,* this species was renamed *montana.* Types of both have been examined. Additional specimens at hand from Colorado, Wyoming and Russell, Manitoba, Canada.

13. *Athysanella globosa* n. sp.

Resembling *robusta,* but small, last ventral segment of female more definitely three-lobed, male pygofer narrowed, but not nearly so ribbonlike, plates much longer, narrower, with truncate apices

and aedeagus without the toothed ventral processes separated from the shaft. Length: Male, 3 mm.; female, 4 mm.

Vertex flat, margins rounding; styles not visible externally; spur on hind tibia of male not quite extending to middle of first tarsal segment.

Color stramineous to tawny; vertex usually with three small black spots on margin; veins of elytra lighter; spots on abdomen quite faint.

Genitalia. Pygofer of male abruptly narrowed, inner margin curving to sharp outer angle; valve about as long as preceding segment, angled; plates wider than valve at base, mesally separated, about as long as greatest width, apices truncate; styles slightly projecting with flat spatulate apices; aedeagus in lateral view widest on middle third, ventral margin serrate on same third, apical third narrower. Last ventral segment of female slightly longer than preceding, lateral margins produced, posterior margin broadly excavated, middle slightly produced, with a tendency to appear notched on either side.

Holotype male, allotype female, 1 male and 3 female paratypes, Grand Canyon, Ariz., E. D. Ball, and in his collection.

14. *Athysanella foeda* n. sp.

Resembling *incongrua,* but somewhat larger, styles of males much heavier, aedeagus with hook at tip and last ventral segment of female with very slender lateral margins and median tooth very short and broad. Length: Male, 4 mm.; female, 5 mm.

Vertex flat, margins rounding; apex of styles visible; spur on hind tibia of male not reaching middle of first segment of tarsi.

Color cinereous, vertex with faint indications of darker marks; elytra veins lighter; dorsum of abdomen with usual dark spots.

Genitalia. Pygofer broadly rounded; valve obtusely rounded; plates as wide as valve at base, sinuately narrowed to broadly rounded tips, mesally not touching, inner margins diverging; aedeagus in lateral view heavy, slightly curved dorsally, with hook at tip. Last ventral segment of female with lateral margins very long and slender, posterior margin deeply excavated with very broad, more or less trilobed median section.

Holotype male, allotype female, and 10 pairs of paratypes, Laramie, Wyo., June 23, 1935, R. H. and Jack Beamer. In Snow collection. Additional specimens at hand from Lyman, Wyo.

15. *Athysanella kanabana* n. sp.

Resembling *bifida,* but larger, female with posterior margin of last ventral segment without a median excavation, and style without divided apex, ending in fingerlike projection as in some of the Amphipyga. Length: Male, 3.5 mm.; female, 5 mm.

Vertex almost convex, margins rounding; styles visible; spur on hind tibia of male extending about two-thirds length of first tarsal segment.

Color cinereous; vertex may have cross dark dash from each ocelli, small black spot at apex, with pair of diverging dashes extending caudad and pair of rounded fuscous areas on disc. Elytra fuscous with light veins; dorsum of abdomen with six quite dark longitudinal stripes, middle four usually with light area in the dark on each segment.

Genitalia. Pygofer slightly narrowed on basal ventral corner and cut off on dorsal outer corner, giving it an angular appearance; valve about as wide as preceding segment, angular; plates wider at base than valve, usually not touching on median line, very short, apices almost truncate; styles with long fingerlike projection on inner margin; aedeagus broad in lateral view, widest at apex, with serrated protrusions on both sides. Last ventral segment of female almost twice as long as preceding, lateral margins sharply excavated for outer half its length, posterior margin rather progressively produced in three more or less definite undulations, the central much the largest.

Holotype male, allotype female, 29 male and 39 female paratypes, Kanab, Utah, August 9, 1936, R. H. Beamer; other paratypes as follows: 18 males and 44 females, Williamson Valley, Ariz., E. D. Ball; 6 males and 1 female, Kanab, Utah, E. D. Ball; numerous specimens, Stafford county, Kansas, salt marsh, R. H. Beamer and P. W. Oman, 1936; other specimens are at hand from the following localities: Wagonmound, N. Mex., Elmendorf, N. Mex., Santa Fe, N. Mex., St. Johns, Ariz., Fredonia, Ariz., Wilcox, Ariz. Types and paratypes in Snow Entomological Collection, paratypes in collection of E. D. Ball and the United States National Museum.

16. *Athysanella salsa* n. sp.

Resembling *utahna,* but usually with dark markings on dorsum, with male plates very short, scarcely surpassing apex of valve on inner margin and with truncate apices, male style with fingerlike process heavier and projecting beyond apex of style and aedeagus

without serrations on ventral margin and ending in a pronounced hook. Length: Male, 3 mm.; female, 4.5 mm.

Vertex flat, margins medium; styles usually visible; spur on hind tibia of male about two-thirds as long as first tarsal segment.

Color stramineous, sometimes tinged with green; elytra with veins faintly lighter; dorsum of abdomen with rows of spots faint.

Genitalia. Pygofer broad, almost rectangular. Valve of male obtusely rounded. Plates very short, scarcely extending beyond valve on inner margin, apices truncate. Styles projecting, fingerlike process heavy, curved, extending beyond style. Aedeagus of medium length, in lateral view sides almost parallel, apex with hook on ventral margin. Last ventral segment of female with lateral lobes of posterior margin, narrow, sharply projecting, median portion very slightly produced, with a semblance of a notch either side middle.

Holotype male, allotype female and numerous male and female paratypes, St. John, Kan., September 11, 1936, R. H. Beamer; additional paratypes as follows: 15 pairs, Stafford county, Kansas, salt marsh, June 30, 1934, D. A. Wilbur; 2 males and 1 female, Lubbock, Tex., June 5, 1929, R. K. Fletcher; one pair, Clarendon Siding, Kan., July 26, 1891, C. F. Baker collection.

17. *Athysanella rostrata* n. sp.

Resembling *plana*, but usually without black spots on the margin of vertex, middle tooth on posterior margin of last ventral segment of female longer than laterals, and style with inner fingerlike projection very long and slender, with apex hooked out. Length: Male, 3.5 mm.; female, 5.25 mm.

Vertex flat, margins medium; styles visible externally; spur on hind tibia of male about two-thirds as long as first tarsal segment.

Color cinereous to tawny, often quite heavily marked with fuscous; vertex sometimes with a cross-dash opposite each ocellus, a pair of diverging dashes at apex; a pair of smoky boxlike spots on disc and a short dash on each side at base; pronotum more or less spotted and banded with brown; elytra brown with light veins; dorsum of abdomen with usual spotting, latter pair of longitudinal stripes much heavier.

Genitalia. Pygofer of male almost rectangular, corners rounded; valve about half as long as preceding segment, angular; plates wider at base than valve, very short, inner margin straight, outer converging, apex truncate; styles with apex bifid, inner fingerlike projec-

tion as long as style, bent out into a clawlike process at apex; aedeagus in lateral view of medium size, narrow at base, gradually enlarging to middle, then narrowing to sharp apex. Last ventral segment of female not as long as preceding, posterior margin divided into three strong teeth, the middle usually about twice as large as the outer.

Holotype male, allotype female and numerous paratypes, Perris, Cal., June 5, 1935, P. W. Oman. Types in United States National Museum.

18. *Athysanella utahna* Osb.

Athysanella utahna Osborn, Herbert, Annals Ent. Soc. Am., XXIII, p. 705, 1930.

Resembling *yumana*, but may be distinguished by the vertex being slightly longer than wide, by the green coloring with no spots, and by the much slenderer processes of the style. Length: Male, 3 mm.; female, 4.75 mm.

Vertex flat, margins sharp; style of male usually visible externally; spur on hind tibia of male about half as long as first tarsal segment.

Color yellowish-green, usually unmarked except spots on dorsum of abdomen, and those rather faint. Venter usually quite dark.

Genitalia. Pygofer broadly rounded; valve not half as long as preceding segment, angular; plates broader at base than valves, converging to rounded apices; style bifurcate at apex; excavation between points deep and evenly rounded; ventral process longest, quite slender; aedeagus in lateral view widest near middle, slightly serrate on ventral margin. Last ventral segment of female slightly longer than preceding, posterior margin deeply excavated with a short, blunt tooth at middle.

Lectoholotype male and lectoallotype female, Ephraim, Utah, July 20, 1914, E. D. Ball, described above, are here designated.

This is the common species in the salty or alkaline areas in the northwestern part of the United States. Specimens are at hand from Washington, Oregon, Idaho, Utah and Arizona.

19. *Athysanella supina* n. sp.

Resembling *Athysanella yumana* Osb., but crown flatter and margins sharper both from dorsal and lateral view; apex of style almost without excavation; elytra without dark longitudinal stripes. Length: Male, 3 mm.; female, 4.5 mm.

Crown flat, margins sharp in dorsal and lateral view; spine on hind tarsi of male about two-thirds as long as first tarsal segment.

General ground color yellowish-green; crown and abdomen often quite heavily embrowned; elytra usually without marks, sometimes veins lighter.

Genitalia. Pygofer of male almost rectangular; valve about as long as preceding segment; angular; plates narrower than valve at base, both margins converging to rounded apex; styles enlarged at tip with broad, inner fingerlike process, in lateral view like *fredonia,* in apical view almost straight, with tip slightly turned in; aedeagus in lateral view widest at middle, tip truncate; ventral margin serrate on middle third. Last ventral segment of female one-half longer than preceding segment, lateral margins strongly produced, posterior margin excavated almost to base with small tooth at middle.

Holotype male, allotype female, 12 females and 28 males, Boca Chica, Texas, May 30, 1933, P. W. Oman; 2 male paratypes, Cameron county, Texas, August 3, 1928, R. H. Beamer, and numerous specimens, Boca Chica, Texas, June 30, 1938, R. H. Beamer. Types in United States National Museum, paratypes in Snow Entomological Collection.

20. *Athysanella bifida* n. sp.

Resembling *foeda,* but much smaller, last ventral segment of female without lateral margins prolonged and inner prong of style very slender and sharp. Length: Male, 3 mm.; female, 4 mm.

Vertex flat, margins sharp; styles usually visible externally; spur on hind tibia of male about half as long as first tarsal segment.

Color cinereous, heavily marked with fuscous; vertex with two dashes at apex, indefinite boxlike spot on disc, with darker spot either side at base in a lighter area; pronotum with cross-row of spots anteriorly, and six longitudinal dark stripes back of these; elytra dark with light veins; dorsum of abdomen with six longitudinal dark stripes, inner pair on each side with a light inclusion on each segment.

Genitalia. Pygofer of medium size, margins slightly converging, apex almost truncate; valve broad, angular, rounded at apex; plates narrower at base than valve, sides slightly converging, apex almost truncate; style bifurcate at apex, outer prong concave next plate, inner branch narrow and sharp; aedeagus in lateral view of medium length, widest on outer third, ventral margin serrate. Last ventral segment of female barely longer than preceding, lateral margins evenly rounded, median third of posterior margin shallowly excavated.

Holotype male, allotype female, and numerous paratypes, Monument, Colo., August 19, 1936, R. H. Beamer; other paratypes as follows: 7 males and 9 females, Hartford, N. Mex., July 17, 1936, R. H. Beamer; 14 females and 15 males, Sisseton, S. Dak., July 23, 1935, P. W. Oman; 4 males and 12 females, Vayland, S. Dak., July 23, 1935, P. W. Oman; numerous males and females, Cheyenne, Wyo., July 20, 1935, P. W. Oman; 3 males and 1 female, Pine Bluff, Wyo., July 20, 1935, P. W. Oman; 5 males and 2 females, Wasta, S. Dak., July 27, 1935, P. W. Oman; 2 females, Wall, S. Dak., July 27, 1935, P. W. Oman; 1 female, Lusk, Wyo., July 21, 1935, P. W. Oman; 3 females, Fox Ridge, S. Dak., June 22, 1927, H. C. Severin; 1 male, Lake Oakwood, S. Dak., June 21, 1921, H. C. Severin.

Types and paratypes in Snow Entomological Collection; paratypes in United States National Museum and collection of E. D. Ball.

21. *Athysanella planata* n. sp.

Resembling *plana,* but distinctly smaller, without black spots on margin of vertex, style of male with smaller fingerlike process distinctly narrower, excavation in apex much deeper and last ventral segment of female with lateral processes longer, with median tooth larger. Length: Male, 2.75 mm.; female, 4 mm.

Vertex flat, margins rounded; styles usually visible externally; spur on hind tibia of male about two-thirds as long as first tarsal segment.

Color milky white, tinged with buff, almost unmarked, sometimes with few light markings on dorsum of abdomen.

Genitalia. Pygofer of male almost rectangular; valve slightly longer than preceding segment, obtusely angular; plates wider at base than valve, margins converging to rounded apices; style greatly enlarged on outer half, bifid, outer process in ventral view under a slip much narrower and longer than inner; aedeagus in lateral view widest at base, slowly narrowing to outer fourth where it rapidly narrows to hooked apex. Last ventral segment of female almost twice as long as preceding, posterior margin excavated almost to base, leaving very long, lateral processes with a fairly broad, angular median process.

Holotype male, allotype female, and numerous paratypes, Newberry Springs, Cal., July 30, 1936, D. R. Lindsay and R. H. Beamer. Types in Snow Entomological Collection.

22. *Athysanella yumana* Osb.

Athysanella yumana Osborn, Herbert, Annals Ent. Soc. Am., Vol. XXIII, p. 704, 1930.

This species is characterized by the vertex being wider than median length, by the dark markings on the vertex, elytra, and abdomen, and by the stout bifid apex of the style. Length: Male, 3 mm.; female, 4.75 mm.

Vertex flat, margins medium; style usually partially visible; spur on hind tibia of male about two-thirds as long as first tarsal segment.

Color cinereous, vertex with indication of cross dash from each ocellus and boxlike mark on disc; pronotum with cross-row of light brown spots; elytra with brown longitudinal stripes, at least partially present; abdominal stripes also at least indicated.

Genitalia. Pygofer rectangular, with outer corners broadly rounded; valve about two-thirds as long as preceding segment, angular; plates broader at base than valve, sides converging to rounded apices; style bifid at apex, both processes quite heavy, dorsal much longer; aedeagus in lateral view thickest on basal half, ventral margin serrate. Last ventral segment of female about twice as long as preceding, posterior margin deeply, angularly excavated, with a small median lobe.

The holotype and allotype were not designated in the original description. There is an empty pin in the Osborn collection carrying the label "type." However, no specimen was marked allotype, so a lectoholotype male and lectoallotype female, Yuma, Ariz., Herbert Osborn, are here designated. Types in collection of E. D. Ball, paratypes in Snow collection, the United States National Museum, and in Osborn collection.

The Subgenus AMPHIPYGA Osb.

Athysanella-like leaf hoppers, the males of which have a rounded pygofer and hind tibia without a spine at apex. The type of genus *Athysanella* (*Amphipyga*) *balli* Osb.

KEY TO THE SPECIES OF AMPHIPYGA

1.		Margin of vertex usually with at least a pair of round black spots	10
		Margin of vertex usually without a pair of round black spots	2
2.	(1)	Style with long fingerlike process on dorsal margin	3
		Style without long fingerlike process on dorsal margin	4
3.	(2)	Fingerlike dorsal process of style with knob at apex *ardua*, p. 27	
		Fingerlike dorsal process of style tapering from base to apex *playana*, p. 27	
4.	(2)	Plates with truncate apices	5
		Plates with rounded apices	8
5.	(4)	Aedeagus with pair of ventral diverging processes, arising at base *rubicunda*, p. 28	
		Aedeagus without such processes	6
6.	(5)	Styles as long as plates	7
		Styles much shorter than plates *nigrofascia*, p. 29	

7. (6) Plates about as long as valve.....*turgida*, p. 36
Plates much longer than valve.....*skullana*, p. 28
8. (4) Aedeagus in lateral view with serrations on ventral margin; plates with dark spot at apices .....*triodana*, p. 30
Aedeagus without serrations on ventral margin or black spot at apex of plates, 9
9. (8) Aedeagus very large at base, tapered to tip; ventral point of style short, curved .....*nimbata*, p. 30
Aedeagus small, not tapered until outer fourth; ventral process of style long, straight, with the ventral point forms an acute angled notch; pygofer with a notched process at apex .....*texana*, p. 31
10. (1) Apical third of style bifid..... 11
Apical third of style not bifid..... 14
11. (10) Ventral point of foot of style rounded.....*anzana*, p. 32
Ventral point of foot of style angular..... 12
12. (11) Longitudinal brown vittae of elytra broad and dark; apex of dorsal point of style slightly enlarged .....*balli*, p. 32
Longitudinal vittae of elytra quite light; dorsal point of style not enlarged.. 13
13. (12) Three markings on margin of vertex, small middle one often with two diverging backward pointing dashes; dorsal point of style almost twice as long as ventral .....*stylata*, p. 33
Two markings on margin of vertex, large, round; dorsal point of style barely longer than ventral .....*reticulata*, p. 33
14. (10) Pygofer with an apical, sharp, black spine..... 15
Pygofer without such a spine..... 19
15. (14) Styles scarcely reaching apex of plates..... 16
Styles protruding beyond plates..... 18
16. (15) Apices of plates evenly rounded; outer third of style oval.....*aridella*, p. 34
Apices of plates with a distinct angle on outer dorsal corner; outer third of style with sides almost parallel, apices almost truncate..... 17
17. (16) Pygofer avicephaliform; aedeagus enlarged at apex.....*attenuata*, p. 37
Pygofer not avicephaliform; aedeagus not enlarged at tip.....*obesa*, p. 34
18. (15) Smaller species ♂ 2.25 mm.; plates almost truncate with long dorsal corner; styles clavate .....*minor*, p. 35
Larger species ♂ 2.75 mm.; darker; aedeagus enlarged on outer half .....*minor* var. *major*, p. 36
19. (14) Plates not reaching beyond valve.....*turgida*, p. 36
Plates reaching beyond valve..... 20
20. (19) Apex of style with hook on dorsal margin.....*hamata*, p. 37
Style without hook 21
21. (20) Largest species in genus ♀ 5, ♂ 3.25; pygofer narrowed with embrowned projection on ventral margin; last ventral segment of ♀ almost straight .....*attenuata* Bk., p. 37
Pygofer hook without projection, much smaller species..... 22
22. (21) Aedeagus with large hump on ventral margin near middle, posterior margin of last ventral segment with spade-shaped projection occupying middle third .....*wilburi*, p. 38
Aedeagus without such a hump..... 23
23. (22) Aedeagus with serrations on dorsal margin; plates usually almost contiguous at base .....*occidentalis*, p. 39
Aedeagus without serrations on dorsal margin..... 24
24. (23) Outer half of styles roundingly oval; aedeagus with coarse serrations on ventral margin; posterior margin of last ventral segment of female almost straight .....*acuticauda*, p. 40
Outer half of styles with sides almost parallel-margined; aedeagus with fine serrations on ventral margin; posterior margin of last ventral segment of ♀ produced 25
25. (24) Plates with apices almost truncate, at least half as wide as at base; posterior margin of last ventral segment of ♀ produced over two-thirds its width with a shallow excavation in its middle.....*modesta*, p. 40
Plates narrowed to rounded tips, not one-third as wide as base; posterior margin of last ventral segment of ♀ slightly produced over broad area..*kansana*, p. 41

23. *Athysanella* (*Amphipyga*) *ardua* n. sp.

Resembling *teres* Ball and Beamer, but easily separated from it by the enlarged apex of the fingerlike process of style and by the plates being much longer than the valve. Length: Male, 3 mm.; female, 4.75 mm.

Vertex flat, margins fairly sharp; enlarged apex of fingerlike process of style usually visible externally.

Color cinereous, elytra sometimes with lighter longitudinal stripes; abdomen with usual rows of small brown spots.

Genitalia. Pygofer of male almost quadrangular, outer corners rounded; valve about as long as preceding segment, angular; plates broader than valve at base and but slightly larger, separated on inner margin; apices bluntly rounded; style enlarged on outer half with very long knobbed inner fingerlike process; aedeagus in lateral view stout, widest at apex with heavy serrations on ventral apical margin. Last ventral segment of female longer than preceding, with lateral angles rounded to broad median projection of posterior margin.

Holotype male, allotype female, 10 female and 14 male paratypes, Lamar, Colo., August 20, 1936, R. H. Beamer; 2 male paratypes, Pueblo, Colo., E. D. Ball; 2 male and 3 female paratypes, Lamar, Colo., July 10, 1899, and 1 male, Snyder, Colo., August 2, 1899; 7 female and 11 male paratypes, Las Animas, Colo., August 20, 1936, R. H. Beamer. Other specimens at hand from Alamosa, Monte Vista, and Garden of the Gods, Colorado. Types and paratypes in Snow Entomological Collection; paratypes in collection of E. D. Ball and Colorado State College.

24. *Athysanella* (*Amphipyga*) *playana* n. sp.

Resembling *ardua* B. & B., but with fingerlike processes of styles converging instead of knobbed, with aedeagus longer and more slender without the large serrations at apex, with shorter plates scarcely exceeding valve. Length: Male, 3 mm.; female, 4.5 mm.

Vertex flat, margins quite rounded; fingerlike process of style usually visible externally.

Color varies from stramineous to cinereous with dark markings; vertex usually light; pronotum flecked with brown; elytra and dorsum of abdomen with quite dark brown longitudinal stripes.

Genitalia. Pygofers broadly rounded. Valve obtusely angled; plates widely separated, about as wide as valve at base, scarcely reaching beyond apex of valve, roundingly blunt; styles with long

narrowing fingerlike process on inner margin; aedeagus long and slender, scarcely curved, apex with dorsal protuberance and apical bulging.

Holotype male, allotype female, 1 female paratype, September 6, 1936, and 2 males and 5 females, June 11, 1936, Wilcox, Ariz., E. D. Ball; 17 pairs of paratypes, Cochise, Ariz., August 24, 1935, R. H. Beamer. Holotype, allotype and paratypes in Ball collection, paratypes in Snow Entomological Collection.

25. *Athysanella* (*Amphipyga*) *rubicunda* n. sp.

Resembling the light form of *nigrafascia* DeL., but easily separated from it by the pink color, by the excavated apices of male plates, the long, diverging, ventral processes of aedeagus and the longer process on the last ventral segment of the female. Length: Male, 3 mm.; female, 3.5 mm.

Structure. Vertex bluntly angular, slightly wider between eyes than median length. Elytra short exposing about five abdominal segments.

Color. Stramineous tinged with pink, process of last ventral segment of female darkened.

Genitalia. Last ventral segment of female with lateral margins rounding to very long, quadrangular median process occupying one-third width of segment. Male valve slightly more than right angle; plates about as wide as valve at base, lateral margins sinuately converging to concave apices, inner margins slightly diverging near apex. Aedeagus almost a straight tube with a pair of ventral processes arising at base, diverging, almost as long as shaft. These processes are unusual in the genus.

Holotype male, allotype female, 1 male and 1 female paratype, Phillips county, Kansas, July 8, 1925, R. H. Beamer; other paratypes; 4 females and 1 male, Portales, N. Mex., July 16, 1936, R. H Beamer; 5 males and 2 females, Sturgis, S. Dak., July 22, 1935, P. W. Oman; 3 males, Colorado, No. 1593, C. F. Baker. Types in the Snow Entomological Collection and paratypes in the U. S. National Museum.

26. *Athysanella* (*Amphipyga*) *skullana* n. sp.

Resembling *wilburi,* but apices of plates of male truncate instead of rounded, apices of styles more rectangular than oval, serrated protrusion on ventral margin of aedeagus on outer third instead of near middle and last ventral segment of female with median pro-

trusion angular instead of rectangular. Length: Male, 3 mm.; female, 4 mm.

Vertex more or less rounded, margins rounding, color cinereous with more or less darker markings; vertex often with more or less indefinite dark marks; pronotum with usual cross row of spots; clytra from semihyaline with lighter veins to dark brown longitudinal bands; dorsum of abdomen with usual rows of brown spots.

Genitalia. Pygofer of male very slightly narrowed to rounded apex with peculiar angled process on inner margin; valve about as long as preceding segment, obtusely angled; plates wider at base than valve, sides slightly narrowed to truncate apices with rounded corners; style enlarged on outer half, widest just before apex, outer margin longest; aedeagus in lateral view almost straight, slightly narrowed at middle, with a peculiar, serrated protrusion on outer fourth on ventral margin. Last ventral segment of female longer than preceding, lateral margin rounding, posterior margin with middle third protruded in form of triangle.

Holotype male, allotype female and 4 female paratypes, Skull Valley, Arizona, April 24, 1904, E. D. Ball. In collection of E. D. Ball.

27. *Athysanella* (*Amphipyga*) *nigrofascia* DeLong and Davidson

Amphipyga nigrofascia DeLong and Davidson, Jr., N. Y., Ent. Soc., No. 2, Vol. XLII, p. 222, 1934.

This species was described from two males from Lodi, Cal. The female is here described for the first time.

Length, 3.75 mm. Colored as the male. Last ventral segment more than twice as long as preceding, lateral margins rounding to a very long, black, rectangular, median projection, occupying about one-third posterior margin.

Allotype female described above, Antioch, Cal., July 30, 1935, R. H. Beamer.

This species is quite variable in color. Out of the 73 females and 70 males taken at the above place and time, about 40 each, males and females, were typically colored, the remainder lacking any dorsal black markings, the projection of the last ventral segment of the female retaining the only dark coloring. National museum material collected in California in 1935 by P. W. Oman showed a variation from almost entirely black individuals to entirely light ones. Male internal genitalia were identical in both forms.

Allotype in Snow Entomological Collection.

28. *Athysanella* (*Amphipyga*) *triodana* n. sp.

Resembles *occidentalis* (Baker), but lacks most of the black markings; the last ventral segment of female is much broader, more nearly truncate and with lateral margins sharply excavated; pygofers broadly rounded and the styles slender and evenly tapered from lateral projection instead of spatulate. Length: Male, 2.75 mm.; female, 4 mm.

Vertex flat, margins rather rounded.

Color from stramineous to cinereous, usually not much color except usual spots on dorsum of abdomen. Some specimens have frontal ares quite black, giving a darkened appearance to the whole face.

Genitalia. Last ventral segment of female not quite twice as long as wide, lateral margins narrowly and sharply excavated to a very broad and long median projection, which is almost truncate. Male pygofer slightly narrowed apically; valve obtusely angled; plates as broad as valve at base, lateral margins sinuately rounded to semisharp apices, mesal margin diverging on outer half; styles on outer half long and slender, gradually tapering to sharp apices.

Holotype male, allotype female, 2 female and 20 male paratypes, Baboquivari Mts., Arizona, July 19, 1932, R. H. Beamer; other paratypes as follows: 10 pairs, Baboquivari Mts., Arizona, August 29. 1931. E. D. Ball.

Holotype, allotype and paratypes in Snow Entomological Collection. Paratypes in Ball collection.

29. *Athysanella* (*Amphipyga*) *nimbata* n. sp.

Resembling *texana,* but much larger, face usually solid black and without comb on pygofer. Length: Male, 3.25 mm.; female, 4 mm.

Vertex flat or excavated, margins sharp, style not visible externally.

Color yellowish-green; vertex often with a fuscous dash at apex; dorsum of abdomen with usual rows of fuscous spots; venter usually black, especially the entire face.

Genitalia. Posterior margin last ventral segment of female almost truncate, slightly protruding at middle; male valve broadly rounded; plates about as wide at base as valve, sinuately narrowed on outer margin to rounded apices; aedeagus short, in dorsoventral view very broad at base tapering to rather short apex. Pygofer broadly rounded.

Holotype male, allotype female, 7 long winged, 1 short winged, female paratypes, Baboquivari Mts., Arizona, August 29, 1931, E. D. Ball; other paratypes as follows: 4 pairs, Patagonia, Ariz., June 24, 1933, R. H. Beamer; 2 females and 10 males, Patagonia, Ariz., June 24, 1933, P. W. Oman; 4 pairs, Tucson, Ariz., September 1, 1929, E. D. Ball. Additional specimens are at hand from Chiricahua Mts., Arizona, Santa Rita Mts., Arizona, and Tombstone, Ariz.

Holotype and allotype in collection of E. D. Ball, paratypes in Snow Entomological Collection and that of United States National Museum.

30. *Athysanella* (*Amphipyga*) *texana* (Osb.)

Pectinapyga texana Osborn, H. Ann. Ent. Soc. Am., P. 697, 1930.
Gladionura aridicola Osborn, H. Ann. Ent. Soc. Am., P. 707, 1930.

About the size of *occidentalis,* but with vertex flat, margins flat and lacking round, black spots. Length, 2-4 mm.

Vertex flat to excavated, margins sharp; style not usually visible externally.

Color cinereous, varying from almost without dark marks to quite heavily marked specimens.

Genitalia. Pygofer of male narrowed to a triangular shape with apex rounded, apex containing a small comblike plate; valve shorter than preceding segment, angular; plates wider at base than valve, strongly constricted on outer margin near middle, apices rounded; style enlarged on outer half with a deep and sharp angular excavation on outer margin, apex sharp. Last ventral segment of female longer than preceding, posterior margin shallowly excavated either side a broad, slightly protruding middle portion.

Types examined. Specimens at hand from Kansas, Oklahoma and Texas. The Kansas specimens are quite consistently larger than the Texas forms.

The presence of the comblike structure does not seem sufficient for generic rank, especially when we find species like *nimbata* and *triodana* which are so like *texana,* but do not have this structure. The genus Pectinapyga is therefore placed in the subgenus Amphipyga.

The female Holotype of *Gladionura aridicola* Osb. was examined and is unquestionably a specimen of *texana,* it therefore becomes a synonym of this species. The male allotype of *Gladionura aridicola* is a specimen of *Athysanella yumana* Osb.

31. *Athysanella* (*Amphipyga*) *anzana* n. sp.

Resembling *playana,* but smaller, plates of male longer, finger of style shorter, more slender, with a distinct excavation between it and apex of shaft, and aedeagus much shorter with larger, serrated apex. Length: Male, 3 mm.; female, 4 mm.

Vertex flat, margins rather acute, styles of male usually exposed.

Color cinereous, usually with dark marks; vertex with two small black spots on margin either side of apex and two short diverging dashes just back of apex; pronotum with a semblance of cross row of spots; elytra and abdomen with usual longitudinal dark stripes.

Genitalia. Pygofers broadly rounded. Valve angular; plates about as wide as valve at base, very short, scarcely reaching beyond valve, slightly narrowed to truncate apices; styles with long fingerlike process on inner margin. Aedeagus short, broadening to rounded tip, ventrally serrate on outer third. Last ventral segment of female with posterior margin slightly produced.

Holotype male, allotype female, 5 males and 1 female paratypes, Anza, Cal., August 6, 1932, J. D. and R. H. Beamer. Types in Snow Entomological Collection.

32. *Athysanella* (*Amphipyga*) *balli* Osb.

Amphipyga balli Osborn, Herbert, Bull. 14, Ohio Biol. Survey, 1928, p. 289.

A beautiful species with its black spots on margin of vertex, its dark oblique vittae of elytra, and characterized by the fingerlike projection on inner margin of style and widely separated triangular plates, with very short inner margins.

Genitalia. Pygofer of male almost rectangular; valve about as long as preceding segment, angular; plates broader at base than valve, short, about as long as valve with truncate apices; style enlarged on outer half, angularly excavated on outer fourth leaving a fingerlike projection. Last ventral segment of female about as long as preceding, lateral margins rounded into short processes, posterior margin slightly excavated to rounding, slightly produced median portion, sometimes a slight indication of notch either side middle.

Holotype female, Marietta, Ohio, September 13, 1905; allotype male, Columbus, Ohio, July 22, so labeled in Osborn collection are here designated.* Other specimens are at hand from Kansas and Iowa.

* Professor Osborn in his revision of this group of insects in the *Annals,* 1930, is often indefinite and failed to follow a uniform practice in his designation of types. Designations will be made and his intent followed wherever possible.

33. *Athysanella* (*Amphipyga*) *stylata* Osb.

Amphipyga stylata Osborn, Herbert, Annals Ent. Soc. Am., Vol. XXIII, p. 694, 1930.

Resembling *reticulata* Osb. very closely, but may be separated from it by the more rounded apices of the male plates, by the longer fingerlike process of the style, by the shorter aedeagus, with one point at apex, and by the posterior margin of last ventral segment of female being convex.

Vertex flat to convex, margins rather sharp; styles of males usually exposed.

Color cinereous with darker markings; vertex with two or three black spots on margin, usually a pair of dashes just back of apex and often a pair of comma-shaped marks at base; veins of elytra often light with dark longitudinal stripes more or less in evidence.

Genitalia. Pygofer of male broadly rounded. Valve obtusely rounded; plates about as broad as valve at base, very slightly narrowed on outer margin, inner margin broadly separated, diverging to rounded apices; styles with right-angled notch near outer third, inner fingerlike process about one-third longer than width of shaft at notch; aedeagus in lateral view widened and ventral margin serrate on outer half with small tooth at apex. Last ventral segment of female with lateral margins slightly produced, posterior margin evenly rounded from these small projections.

Holotype female, allotype male, Grand Junction, Colo., H. Osborn, so labeled in Osborn collection are here designated. Numerous specimens of both sexes are at hand from Palisades, Colo., August 16, 1936, R. H. Beamer.

34. *Athysanella* (*Amphipyga*) *reticulata* Osb.

Amphipyga reticulata Osborn, Herbert, Annals Ent. Soc. Am., Vol. XXIII, p. 691, 1930.

Resembling *balli* Osb., but without heavy, dark markings; is larger, aedeagus longer with larger ventral serrations, male plates longer and sharper and posterior margin of last ventral segment of female is excavated instead of produced. Length: Female, 4 mm.

Vertex hardly flat, margins rounded.

Color cinereous; vertex with two round, black spots; elytra with veins lighter, with tendency to brown longitudinal stripes; abdomen with usual spotting.

Genitalia. Male pygofer broadly rounded. Valve obtusely angled; plates as broad as valve at base, mesal margins separated at base, sharply diverging to sharp apices; styles with right-angled notch at apex, fingerlike inner process about as long as width of shaft at notch. Aedeagus in lateral view with sides almost parallel, ventral

margin roughly serrate, apex apparently with two teeth. Last ventral segment of female with lateral margins produced, posterior margin excavated with slightly produced median tooth.

Although the original description says "Described from two females from the collection of E. D. Ball, Elsinore, Utah, April 22, 1906," there are three females in Doctor Ball's collection from Elsinore, Utah, 2 with paratype labels and one with the printed word "Type." This latter specimen is here designated *holotype*. The male, Monroe, Utah, July 25, 1906, described above, does not have black spots of vertex, so it is not here designated. Types in Ball collection.

35. *Athysanella (Amphipyga) aridella* Osb.

Amphipyga aridella Osborn, Herbert, Annals Ent. Soc. Am., D.c., 1930, p. 693.
Amphipyga californica Osborn, Herbert, Annals Ent. Soc. Am., Dec., 1930, p. 696.

This species resembles *occidentalis*, but is usually more reddish in color and characterized by a distinct tooth on the outer margin of an otherwise rather blunt pygofer. Length, 1.75-2.25 mm.

Vertex not flat, margins rounded; style of male not exposed.

Color stramineous with a reddish tinge with two large, round, black spots on margin of vertex, and sometimes a tiny apical spot.

Genitalia. Pygofer of male narrowed to blunt apex with a sharp tooth on ventral corner; valve about as long as preceding segment, obtusely rounded; plates broader than valve at base, sides converging to rounded apices; style enlarged on outer half, clavate with rounded apex; aedeagus in lateral view with sides almost parallel, curved dorsally, ending in a light hook, in ventral view enlarged on outer half, margin serrated, apex sharp. Last ventral segment of female about as long as preceding, lateral margins rounded, posterior margin slightly excavated from lateral lobes to a median lobe of about same length.

Holotype female and lectoallotype male, Tucson, Ariz., Herbert Osborn, are here designated.

Although no types were designated in the original description, a female from Tucson bore a holotype label. Another female from Mojave, Cal., bore the allotype label. Therefore, some error in placing this last label was made. A paratype male from the Osborn collection is therefore chosen for the lectoallotype.

36. *Athysanella (Amphipyga) obesa* n. sp.

Resembling *aridella Osb.*, but much larger, male plates much sharper, styles more slender, and last ventral segment of female with lateral margins rounded to slightly excavated posterior margin. Length: Male, 3 mm.; female, 4 mm.

Vertex scarcely flat, margins rounded; styles not exposed.

Color cinereous; two black spots on margin of vertex; veins of elytra lighter; usual spotting on dorsum of abdomen.

Genitalia. Pygofer of male large, narrowed to blunt apices with large tooth on ventral corner; valve shorter than preceding segment, roundingly obtuse; plates wider at base than valve, inner margins touching at base, rounding to rather sharp apices with a fuscous spot; style clavate on outer half with small protuberance on outside, apex rounded; aedeagus in lateral view slightly wider near middle, ending in sharp beaklike tip, in dorsoventral view flaring on outer half, with serrate edges. Last ventral segment of female slightly shorter than preceding, lateral margins broadly rounded, shallowly excavated posterior margin.

Holotype male, allotype female, and 2 male paratypes, Calhan, Colo., August 19, 1936, R. H. Beamer; other paratypes, 1 male, Mustang Mt., Arizona, June 12, 1933; 2 females and 1 male, Sanderson, Tex., June 5, 1933, P. W. Oman; 1 female, Garden of the Gods, Colorado, August 19, 1936; 1 male, Sturgis, S. Dak., July 22, 1935, P. W. Oman; 3 males and 1 female, Mustang Mt., Arizona, June 12, 1933, P. W. Oman. Types in Snow Entomological Collection, paratypes in United States National Museum and collection of E. D. Ball.

37. *Athysanella* (*Amphipyga*) *minor* n. sp.

Resembling in general appearance *occidentalis,* and in genitalia *aridella.* It may be separated from the first by the large tooth on the posteroventral corner of pygofer and from the latter by the broad, angularly truncated plates with the protruding styles. Length: Female, 3 mm.; male, 2.25 mm.

Vertex obtusely angled, wider than pronotum, slightly wider than median length.

Color. Generally dark. Vertex with apical spot and rectangular one either side black; pair of small triangles back of apical spot and a pair of median longitudinal, almost parallel, stripes reaching base with short dash outside these and a longer one next eyes. Pronotum with an irregular row of black spots on anterior margin. Elytra dark with veins lighter. Abdomen dark with lighter longitudinal vitae and rows of spots.

Genitalia. Last ventral segment of female slightly narrower than preceding; posterior margin very slightly trilobed. Male valve obtusely rounded; plates about as wide at base as valve, slightly narrowed to truncated apices with outer margins longer; styles apically

enlarged, slightly protruding. Aedeagus slightly curved dorsally, in dorsoventral view enlarged on outer third to form a diamond-shaped tip. Pygofers more than twice as long as wide, posteroventral corner with a large tooth.

Holotype male, allotype female, 20 female and 25 male paratypes, Campo, Cal., August 10, 1935, R. H. Beamer.

37a. *Athysanella* (*Amphipyga*) *minor* var. *major* n. var.

Like *minor* Ball and Beamer, but much larger, with aedeagus enlarged on outer half, sharper pointed, with tooth of pygofer more pronounced and with apices of plates slightly excavated and outer corner more pronounced. Length: Female, 3.75 mm.; male, 2.75 mm.

Holotype male, allotype female, 4 male and 8 female paratypes, Newton, Cal., June 1, 1935, P. W. Oman.

38. *Athysanella* (*Amphipyga*) *turgida* n. sp.

Resembling *playana,* but vertex usually with black spots on margin; style curved dorsad at apex and aedeagus much enlarged at apex. Length: Male, 2.75 mm.; female, 4 mm.

Vertex flat, margins rounded; styles exposed externally.

Color cinereous, usually with three black spots on margin of vertex and disc more or less infuscated; pronotum and elytra with or without dark markings; dorsum of abdomen with usual dark spots.

Genitalia. Last ventral segment of female more than twice as wide as preceding, lateral margins definitely extended, posterior margin roundingly excavated to form a convex mesal portion slightly shorter than lateral corners. Male valve angular, plates very short, not exceeding valve, about as broad at base as valve, rounded to blunt apices, widely separated on mesal margin. Style long, swollen on outer third, narrowed to slender curving tip. Aedeagus in lateral view gradually broadened to truncate tip.

Holotype male, allotype female, 5 male and 6 female paratypes, Boulder Dam, Ariz., September 16, 1934, E. D. Ball; other paratypes, 7 males, 10 females, Yuma, Ariz., March 30, 1932, E. D. Ball; 3 females, 12 males, San Jacinto Mts., California, east of Pinon Flats, June 4, 1935, P. W. Oman; 2 females, Alamo, Ariz., August 14, 1935; 2 males and 3 females, Sentinel, Ariz., August 24, 1938, R. H. Beamer. Types and paratypes in collection of E. D. Ball, paratypes in United States National Museum and in Snow Entomological Collection.

39. *Athysanella* (*Amphipyga*) *hamata* n. sp.

Resembling *acuticauda*, but male pygofers about half as wide, plates sinuate on inner margin, styles with apical outward turning hook and last ventral segment of female with lateral angles rounding to a broad curved median projection. Length: Male, 2.75 mm.; female, 4 mm.

Vertex flat, margins rounded; style not exposed.

Color cinereous to yellowish-green; usually with two large and one small black spot on margin of vertex; elytra with veins usually lighter, with or without dark markings; abdomen usually with customary dark spotting.

Genitalia. Pygofer narrowed apically to about one-third median width. Male valve obtusely angulate, plates as broad at base as valve, concavely narrowed on both margins to rather sharp apices. Styles long, swollen on outer third, sharply narrowed to outward curving hook at apex. Aedeagus almost straight in lateral view, much thicker at base than at apex, ventral serrations fine.

Holotype male, allotype female, 7 male and 11 female paratypes, Santa Fe, N. Mex., July 20, 1936, R. H. Beamer; one paratype, Antonio, Colo., August 5, 1900; 4 male and 7 female paratypes, Laramie, Wyo., July 30, 1935, P. W. Oman. Types and paratypes in Snow Entomological Collection. Paratypes in Agricultural College Collection, Fort Collins, Colo., and United States National Museum. A nice series of what is apparently this species are at hand from Pecos, N. Mex., P. W. Oman. They lack the round, black spots on the margin of the vertex and are therefore not included in the paratype series.

40. *Athysanella* (*Amphipyga*) *attenuata* Baker

Athysanella attenuata Baker, C. F., Psyche, 1898, p. 188.
Amphypyga alta Osborn, Herbert, Annals Ent. Soc. Am., Dec., 1930, p. 693.
Athysanella extrusa Osborn, Herbert, Annals Ent. Soc. Am., Dec., 1930, p. 703.

This is one of the largest species in this genus. Described from four males and numerous females from Colorado.

The species is easily characterized by the avicephaliform pygofer and its large size. Length: Male, 4 mm.; female, 5 mm.

Vertex flat, margins angular; styles hidden.

Color cinereous marked with fuscous; vertex with or without two or three black spots; veins of elytra usually lighter; sometimes with brown longitudinal stripes; abdomen with usual spots.

Genitalia. Pygofer of male narrowed to an avicephaliform apex with beak on ventral margin; valve almost twice as long as preced-

ing segment, angular; plates wider at base than valve, inner margins almost touching at base, rounded to outer margin to form sharp apices, characteristic dark spot on inner margin one-third distance from apex; style clavate, process distinct on outer margin just before club, apex rather slender; aedeagus in lateral view large, widest at tip with a serrated flangelike projection on all four margins on outer fourth. The last ventral segment of female considerably longer than preceding, lateral margins excavate to rounded corners, posterior margin very slightly produced throughout about two-thirds middle portion.

Lectoholotype brachypterous female, Fort Collins, Colo., August 18, 1935, C. F. Baker (Colorado, 1600), bearing Baker's red determination label. Lectoallotype, brachypterous male, Fort Collins, Colo., August 6, 1895, C. F. Baker (Colorado, 1589), are here designated. Types in United States National Museum.

This is one of the commonest species throughout its range. Specimens have been examined from Kansas, Colorado, New Mexico, Texas, Oklahoma, Arizona, Utah, Montana, and Wyoming.

Types of the species placed in synonymy have been examined. Those of *alto* Osb. are specimens of *attenuata* that lack the black spots, a common occurrence. In *extrusa* the females are all *attenuata* and the males another species. Since a female was designated and labeled holotype, the name must fall. The original difficulty came about through the incorrect association of a male for *attenuata*, thus dislocating several forms.

41. *Athysanella* (*Amphipyga*) *wilburi* n. sp.

Resembling in general size and coloring *acuticauda* Bk., from which it may be separated by the long median projection on the posterior margin of the last ventral segment of the female and by the large serrated median hump on the ventral margin of the aedeagus. Length: Female, 3.75 mm.; male, 2.75 mm.

Vertex roundingly angled, slightly longer at middle than width between eyes. Males without spines on hind tibiae.

Color. General color stramineous. Vertex with small apical spot and larger rectangular one either side, black. Veins of elytra lighter. Abdomen flecked with darker spots.

Genitalia. Last ventral segment of female with lateral angles rounded to a very long quadrangular median process, about as long as width of segment. Median portion of segment often darkened. Male valve roundingly obtuse. Plates about as wide at base as valve, sinuately narrowed to rounded apices, black spot apically outside

middle. Aedeagus in lateral view slightly curved dorsally with large serrated median hump on ventral margin.

Holotype male, allotype female, and numerous male and female paratypes, Medora, Kan., June 25, 1936, R. H. Beamer and P. W. Oman. Additional paratypes as follows: 1 female, McPherson county, Kansas, June 28, 1923; 1 female, Dodge City, Kan., July 2, 1935; 10 pairs, Sandhills, Medora, Kan., D. A. Wilbur.

This species is named in honor of Prof. D. A. Wilbur, Manhattan, Kan., who has collected a great many interesting Kansas Cicadellids.

42. *Athysanella* (*Amphipyga*) *occidentalis* Baker

Athysanella occidentalis Baker, C. F., Psyche, March, 1898, p. 186.
Athysanella minuta Baker, C. F., Psyche, March, 1898, p. 189.

Resembling *acuticauda,* but smaller, plates of male usually contiguous at base, aedeagus serrated on dorsal margin and median lobe of last ventral segment of female extending beyond laterals. Length: Male, 2 mm.; female, 3 mm.

Vertex flat, margins rounding, style hidden.

Color tawny gray; vertex with two large, black spots and usually a smaller apical one; elytra with veins lighter; usual dark spots on dorsum of abdomen.

Genitalia. Pygofer of male narrowed to roundingly sharp valve about one-third longer than preceding segment, obtusely rounded; plates wider than valve at base, contiguous at base on inner margin, outer margin strongly excavated on outer half, inner margin rounding to rather sharp point; style enlarged on outer half with earlike projection on outer margin near middle, apex rounded; aedeagus in lateral view widest near outer third, serrate on dorsal margin, ventral margin rounding at tip to sharp apex. Last ventral segment of female of about same length as preceding, lateral margins excavated to rounded corners, posterior margin with middle portion roundingly produced, always longer than lateral corners.

Lectoholotype brachypterous female, Fort Collins, Colo., June, C. F. Baker (Colorado 1638), bearing Bakers's red determination label. Allotype, brachypterous male, Fort Collins, Colo., July 19, 1935, P. W. Oman. Types in United States National Museum.

Specimens have been examined from Colorado, South Dakota, Kansas, New Mexico, Arizona, Oregon, Utah, Wyoming. Washington, British Columbia, and Montana.

43. *Athysanella* (*Amphipyga*) *acuticauda* Baker

Athysanella acuticauda Baker, C. F., Psyche, March 1898, p. 187.

Resembling *occidentalis,* but much larger, plates widely separated at base; aedeagus serrated on ventral margin and last ventral segment of female with posterior margin almost straight across. Length: Male, 3 mm.; female, 4 mm.

Vertex flat, margins rounded, plates open, styles more or less visible.

Color dark yellowish-gray, heavily marked with fuscous. Vertex with two large black spots on margin and smaller one at apex; disk often embrowned; elytra dark with light veins; dorsum of abdomen with usual dark marks.

Genitalia. Pygofer of male narrowed on ventral margin to blunt corner on inner margin (view under a slip); valve longer than preceding segment, obtusely rounded; plates broader at base than valve, separated by about half their width at tip of valve, inner margin angled to sharp apices, outer margin slightly excavated on outer third; style enlarged on outer half, clavate, apex oval; aedeagus in lateral view curved dorsally, widest at base with a few large serrations on ventral margin. Last ventral segment of female considerably longer than preceding, lateral margins slightly excavated to fairly angular corners, posterior margin slightly excavated to almost flat middle portion.

Lectoholotype female, brachypterous, Campton's, Colorado, altitude, 7,000 ft., July 21, 1895, C. F. Baker (Colorado, 1580), bearing Baker's red determination label. Lectoallotype, brachypterous male, Algonquin, Ill., August 1, 1895. In United States National Museum. Specimens have been examined from Maine, New Hampshire, Michigan, Wisconsin, Colorado, New Mexico, Utah, South Dakota, North Dakota, Minnesota, and Wyoming.

44. *Athysanella* (*Amphipyga*) *modesta* n. sp.

Resembling *occidentalis* Baker, but with lateral margins of last ventral segment of female sharply emarginate, leaving a very broad and long median projection which is slightly excavated mesally, male plates much shorter with broad apices and pygofer of male longer and more slender. Length: Male, 2.75 mm.; female, 3 mm.

Vertex flat, margins rounded; style usually hidden.

Color cinereous, heavily embrowned; vertex with two large black spots on margin, smaller one at apex, disc more or less embrowned; anterior half of pronotum heavily spotted, remainder embrowned;

elytra brown with veins lighter; abdomen with usual brown spots and stripes.

Genitalia. Last ventral segment of female about a third longer than wide, lateral margins sharply emarginate to a very long and broad median projection shallowly excavated mesally on posterior margin. Male valve broadly rounded, almost as long as wide; plates quite short, about as wide at base as valve, slightly narrowed to broad, almost truncate tips. Pygofer of male long and narrow, apices about one-fourth basal width.

Holotype male, allotype female, and 14 pairs of paratypes, Lockwood, Cal., July 24, 1935, R. H. Beamer. Types in Snow Entomological Collection.

45. *Athysanella* (*Amphipyga*) *kansana* n. sp.

Resembling *acuticauda,* but plates of male more rounded at apex with a slight excavation on inner margin, separated about half as far as in *acuticauda,* apical half of style not enlarged into clubs and last ventral segment of female with median lobe distinctly longer than laterals. Length: Male, 3.5 mm.; female, 4.5 mm.

Vertex flat, margins rounding, styles usually hidden.

Color cinereous, heavily embrowned; vertex with two black spots on margin and a smaller one on apex, disc with embrowned area near base and pair of angled dashes at each side; elytra dark with veins lighter; abdomen with usual dark areas.

Genitalia. Pygofer of male narrowed to rounded apex; valve about as long as preceding segment, angular; plates wider at base than valve, separated by a distance about equal to width of dark area of tips, rapidly narrowed to narrow apices, inner margin slightly excavated; aedeagus in lateral view tapering from base to apex, slightly curved dorsally with rather fine serrations on ventral margin; style in lateral view with long tooth on outer margin near middle, tapered from there to rather blunt apex. Last ventral segment of female longer than preceding, lateral margins excavated for about half their length to rounded lateral corners, posterior margin slightly excavated from lateral lobes to a distinct, broader median lobe.

Holotype male, allotype female, and numerous paratypes, Nickerson, Kan., June 26, 1936, R. H. Beamer; other paratypes as follows: 10 males, 5 females, Sterling, Kan., June 26, 1936, P. W. Oman. Types and paratypes in Snow Entomological Collection, paratypes in United States National Museum and collection of E. D. Ball.

Subgenus GLADIONURA Osborn

Athysanella-like leaf hoppers with male pygofer narrowed to black hook or process on outer ventral portion and hind tibia with a spur at apex. Genotype—*Athysanella* (*Gladionura*) *argenteola* (Uhl.).

KEY TO THE SPECIES OF GLADIONURA

1. With a round, black spot on margin of vertex midway between eye and apex.... 2
   Without such a round, black spot 7
2. (1) Outer half of style having form of bent knee with foot attached; posterior margin of last ventral segment of female deeply excavated with long, slender lateral processes ..... *curtipennis*, p. 43
   Outer half of style without such form; ♀ segment not deeply excavated... 3
3. (2) Apex of style distinctly bifid, not projecting beyond plates..... *dubia*, p. 44
   Apex of stlye not bifid, projecting beyond plates..... 4
4. (3) Outer third of style roughly sagittate, ventral margin with a hump near end of plate 5
   Outer third of style not sagittate, ventral margin almost straight..... 6
5. (4) Styles very long, projecting one-third their length beyond plates; plates truncate at apex, considerably broader than long..... *truncata*, p. 45
   Styles with outer point only projecting beyond plates; plates about as long as wide, apex more rounded..... *blanda*, p. 45
6. (4) Style widest on outer third..... *blanda*, p. 45
   Style widest before outer third..... *callida*, p. 46
7. (1) Outer portion of style in lateral view resembling a human foot or boot..... 8
   Outer portion of style not resembling a foot or boot..... 10
8. (7) Outer third of pygofer narrowed into a very long slender spine, longer than foot of style ..... *uncinata*, p. 47
   Outer third of pygofer narrowed into a hook hardly half as long as foot of of style 9
9. (8) Style in lateral view much broader through heel of foot than near middle of style ..... *casa*, p. 48
   Style in lateral view about same width through heel of foot as at middle of style; toe of foot extended sharply caudad..... *alsa*, p. 48
10. (7) Apex of style in lateral view bifid..... 11
    Apex of style in lateral view not bifid..... 16
11. (10) Plates with truncate apices, outer dorsal corner embrowned..... *emarginata*, p. 49
    Plates usually rounded, dorsal margin much longer and not embrowned.... 12
12. (11) Arms of apex of style in lateral view more or less equal in length and breadth ..... *furculata*, p. 50
    Dorsal arm of apex of style very small, not over half as wide at base as ventral arm 13
13. (12) Dorsal arm of style sharply angular; excavation between arms very shallow and evenly curved ..... *vata*, p. 50
    Dorsal arm of style evenly rounded; excavation deep, more or less angular.. 14
14. (13) Spine on hind tibia of male about as long as first tarsal segment.... *libera*, p. 51
    Spine on hind tibia of male only about half as long as first tarsal segment.. 15
15. (14) Dorsal point of style quite evenly rounded at base, about three times as wide as ventral point ..... *viridula*, p. 52
    Dorsal point of style narrower and more angular, about twice as wide as ventral point at base; adult insect about ⅛ smaller..... *molesta*, p. 52
16. (10) Apex of style in lateral view avicephaliform..... *adunca*, p. 53
    Apex of style not avicephaliform..... 17
17. (16) Apex of pygofer hook avicephaliform in lateral view on slide..... 18
    Apex of pygofer hook not avicephaliform..... 21
18. (17) Posterior margin of last ventral segment of ♀ with barely a semblance of lobes; style evenly tapered on outer third to tip or excavated only on ventral margin 19
    Posterior margin of last ventral segment of ♀ definitely lobed; style on outer third excavated on both margins 20

19. (18) Style with both margins evenly curved in on outer third..... *sinuata*, p. 53
Style on outer third excavated on ventral margin..... *sinuata* var. *lobata*, p. 54
20. (18) Last ventral segment of ♀ with all lobes of about equal length; apex of style narrow, curved dorsally..... *lunata*, p. 55
Last ventral segment of ♀ with middle lobe longest; apex of style truncate, about straight ..... *concava*, p. 55
21. (17) Plates with truncate apices 22
Plates with rounded or sharp apices..... 27
22. (21) Style in lateral view constricted on each margin before tip; apex rounded *nacazarana*, p. 56
Style not constricted on each margin just before tip..... 23
23. (22) Apex of style truncate 24
Apex of style more or less rounded..... 25
24. (23) Style clavate on outer third with lobe on dorsal margin before tip.. *clavata*, p. 57
Style not clavate. Ventral margin deeply excavated on outer third, *directa*, p. 57
25. (23) Venter usually black; ventral margin of style straight at apex sharply rounded to dorsal margin ..... *nigriventralis*, p. 58
Venter not usually black; ventral margin of style undulating..... 26
26. (25) Plates as broad at apex as base, margins parallel; style with large lobe on dorsal margin just before apex; ♀ segment very slightly 3 lobed. *dentata*, p. 59
Plates narrower at apex than base, margins converging; both margins of style undulating; ♀ segment deeply excavated..... *excavata*, p. 59
27. (21) Dorsal margin of plates produced into long sharp points..... 28
Dorsal margin not produced into long sharp points..... 30
28. (27) Style curved ventrally in lateral view..... *curvata*, p. 60
Style curved dorsally 29
29. (28) Apex of style truncate..... *contracta*, p. 61
Apex of style round ..... *sagittata*, p. 62
30. (27) Apex of style reaching tip of plates..... 31
Apex of style exceeding plate by its own width, bent ventrally.... *arcana*, p. 62
31. (30) Style spatulate; last ventral segment of ♀ with definite, rather slender lateral lobes ..... *argentola*, p. 63
Style with apex narrowed; excavated on ventral margin; last ventral segment of ♀ without lateral lobes ..... *diversa*, p. 64

46. *Athysanella* (*Gladionura*) *curtipennis* Gill. & Bk.

Athysanus curtipennis Gillette and Baker, Hemip., p. 92, 1898.
Gladionura extensa Osborn, H. Ann. Ent. Soc. Am., p. 711, 1930.

This species is easily recognized by the large, black, footlike styles that are nearly always visible in caudal view, and the very long, slender, lateral lobes on the last ventral segment of the female.

Crown slightly flattened with quite rounded margins; distance between eyes much greater than length of crown at middle. Spur on hind tibia of male usually less than half as long as first tarsal segment.

General color cinereous, with many dark markings, most striking of which are three black spots on margin of crown, a small central and two large laterals; base of crown with two angular dashes and a large spot; pronotum flecked with brown; elytra and abdomen tending to have longitudinal brown lines.

Genitalia. Pygofer of male with attenuated portion almost as long as basal portion, apex with rounded hook; valve slightly longer than preceding segment, rounded; plates wider at base than valve,

rather short, sides almost parallel, apex truncate; styles sinuate, apex in form of a foot with toe in heel out, quite easily visible from exterior and will separate this species from all others; aedeagus in lateral view about as long as styles, almost parallel-sided, slightly curving dorsally, dorsal margin cut away at apex to sharp tip. Last ventral segment of female slightly longer than preceding, lateral margins excavated from base to very long lateral projections, posterior margin broadly and deeply excavated (almost to base) to very slight median prominence.

Holotype female, Colorado Springs, Colo., August 3 (Gill.) allotype male, Colorado, May 13, 1898. In collection Colorado State College, Fort Collins, Colo. Specimens are at hand from Colorado, Arizona, Kansas, Texas, Oklahoma, New Mexico. This is one of the commonest, widespread species in the genus. The type of *extensa* was studied and proved to be a male of *curtipennis*.

47. *Athysanella* (*Gladionura*) *dubia* n. sp.

Related to *libera* in genitalia, but much larger, crown more rounded, with round, black dots on margin, styles of male of same type, but hardly half as large, and inner fork about same length as outer. Length: Male, 3.5 mm.; female, 5 mm.

Crown almost excavated, margins broadly rounded; spur on hind tibia of male about as long as first tarsal segment.

General color cinereous with many brown markings. Crown with two black spots on margin, two diverging dashes at apex, and mark on each half of disc, with a comma mark at base; pronotum with eight small, black spots; scutellum usually with two; elytra with brown longitudinal lines; abdomen with longitudinal rows of brown spots; venter more or less darkened.

Genitalia. Pygofer with apices narrowed into long, black, slightly curved points; valve about as long as preceding segment, obtusely angulate; plates wider than valve at base, long, inner margin rounded to outer, not so nearly truncate as in *libera;* styles enlarged on outer half, bifid, prongs of about same length, outer hardly half as wide as inner, the whole scarcely half as large as in *libera*; aedeagus of medium length, in lateral view slightly curved dorsally, sides almost parallel, apex excavated from dorsal margin. Last ventral segment of female about as long as preceding, posterior margin almost straight with a semblance of notches either side a median tooth.

Holotype male, allotype female, 3 male and 1 female paratypes, Baboquivari Mts., Arizona, August 29, 1931, E. D. Ball; other para-

types as follows: 2 males, Nogales, Ariz., September 19, 1931, E. D. Ball; 1 pair, Baboquivari Mts., Arizona, August 19, 1932, R. H. Beamer.

Types and paratypes in collection of E. D. Ball, paratypes in Snow Entomological Collection.

48. *Athysanella* (*Gladionura*) *truncata* n. sp.

Size and form of *curtipennis,* but usually very light colored except black spots of margin of vertex; styles not boot-shaped, but saggittal, extending beyond plates and female last ventral segment without long lateral lobes. Length: Male, 3.25 mm.; female, 5 mm.

Vertex slightly convex, margins rounded; spur of hind tibia of male scarcely half as long as first tarsal segment.

General color stramineous, marked with three brown spots on margin of vertex, sometimes with darker markings.

Genitalia. Pygofer of male narrowed to long, black, slightly bent apex; valve longer than preceding segment, obtusely angular; plates broader at base than valve, short, sides almost parallel, apices truncate, sometimes slightly excavated; style, projecting almost one-third its length, enlarged on outer third, both margins converging rapidly to sharp apex; aedeagus of usual form. Last ventral segment of female usually almost hidden beneath preceding segment, posterior margin sinuately rounded, middle portion protruding slightly.

Holotype male, allotype female, and numerous paratypes, Roswell, N. Mex., July 16, 1936, R. H. Beamer and D. R. Lindsay; other paratypes as follows: numerous specimens, Malaga, N. Mex., July 11, 1936, R. H. Beamer. Types in Snow Entomological Collection and paratypes in collection of E. D. Ball.

49. *Athysanella* (*Gladionura*) *blanda* n. sp.

Resembling *truncata,* but male plates longer with rounding margins, style but slightly projecting, and not nearly so enlarged. Length: Male, 3 mm.; female, 4.25 mm.

Vertex flat, with margins rounded; spur on hind tibia short, about one-third as long as first tarsal segment.

General ground color stramineous, with darker markings. Vertex with three black spots on margin; elytra with several light brown longitudinal vittae; dorsum of abdomen with brown spots in longitudinal lines.

Genitalia. Pygofer of male narrowed into very long, black, slightly curved apex; valve about as long as preceding segment, angular;

plates broader at base than valve, about as long as valve, inner margin curving to blunt apices; style enlarged on outer two-thirds, sudden swelling on both margins one-third distance to sharp tip; aedeagus typical of the group. Last ventral segment of female almost entirely hidden beneath preceding, showing at middle as an angular process.

Holotype male, allotype female, and numerous paratypes, Belen, N. Mex., July 20, 1936, R. H. Beamer and D. R. Lindsay; other paratypes as follows: numerous specimens, Cochise, Ariz., August 24, 1935, R. H. Beamer; numerous specimens, Wilcox, Ariz., 1934 and 1936, E. D. Ball; 3 pairs, White Sands, N. Mex., July 7, 1933, P. W. Oman.

Types and paratypes in Snow Entomological Collection, paratypes in U. S. N. M. and collection of E. D. Ball.

Gladionura blanda var. *vana* n. var.

Resembling *blanda,* but pygofer of male short and inner margin of style with almost no hump.

Holotype male, allotype female, Bisbee, Ariz., July 16, 1934, E. D. Ball; other paratypes as follows: numerous specimens, Cochise, Ariz., August 24, 1935, R. H. Beamer; 3 males, White Sands, N. Mex., June 7, 1933, P. W. Oman; 2 males and 4 females, Wilcox, Ariz., 1936, E. D. Ball.

Wherever we collected *blanda* specimens with short or cut off pygofers were taken. Coupled with the cut off pygofer was the style with the almost smooth inner side. This is surely just a variation of *blanda.*

50. *Athysanella (Gladionura) callida* n. sp.

Resembling *truncata,* but male plates long, sides converging and style without the great enlargement on outer third.

Vertex slightly convex, margins rounded; spur on hind tibia scarcely more than one-third as long as first tarsal segment.

Color stramineous; vertex with three black spots on margin, laterals much the largest; elytra with faint longitudinal brown lines; dorsum of abdomen with indication of rows of brown spots.

Genitalia. Pygofer of male narrowed to black, almost straight apex; valve longer than preceding segment, obtusely angular, plates wider at base than valve, as long as valve, sides converging to flat apices; style somewhat enlarged on outer half, sides converging on outer third to rather pointed apex; aedeagus of typical form; last

ventral segment of female almost hidden beneath preceding, posterior margin barely showing, very slightly longer at middle.

Holotype male, allotype female, 9 male and 5 female paratypes, Malaga, N. Mex., July 11, 1936, R. H. Beamer; 10 male and 8 female paratypes, Roswell, N. Mex., July 16, 1936, R. H. Beamer and D. R. Lindsay. Types in Snow Entomological Collection, paratypes in collection of E. D. Ball.

51. *Athysanella* (*Gladionura*) *uncinata* n. sp.

Resembling *casa*, but outer third of pygofer narrowed into a spine longer than foot of style, and last ventral segment of female with very long median lobe, with practically no laterals. Length: Male, 3 mm.; female, 5.25 mm.

Vertex flat, margins rather sharp; spur short, about one-third length of first tarsal segment.

Color yellowish-green, sometimes with more or less spotting on vertex and dorsum of abdomen.

Genitalia. Pygofer of male narrowed to very long, black, slender apex, turned at right angles; valve about as long as preceding segment, angular; plates wider at base than valve, very long, inner margin curving out to sharp apices; style in lateral view with long projection on outer side near middle, remainder looking much like a decrepit human limb from knee to toe, heel on inner margin in apical view apex with right angled bend toward plate; aedeagus of usual type. Last ventral segment of female about one-third longer than preceding, lateral margins very short, slightly lobed, posterior margin slightly excavated from small lateral lobes to a very large almost quadrate median lobe.

Holotype male, allotype female, 4 female and 6 male paratypes, Bisbee, Ariz., 1934-36, E. D. Ball; other paratypes as follows: numerous specimens, Mustang Mt., Arizona, August 22, 1935, R. H. Beamer; Pearce, Ariz., August 23, 1935, Oxona, Tex., July 9, 1936, Fort Stockton, Tex., July 11, 1936, Lake Kemp, Tex., June 29, 1936, R. H. Beamer; 3 pairs, Chiricahua Mts., Arizona, 1930, E. D. Ball; 4 females, Huachuca Mts., Arizona, 1931, 1 male, 2 females, same place, 1935, E. D. Ball; 1 male, Mustang Mt., Arizona, June 26, 1933, P. W. Oman; other specimens at hand from the following places: Leverton, Tex., Santa Rita Mts., Arizona, Benson, Ariz., Apache, Ariz., Douglas, Ariz., Santa Catalina Mts., Arizona, Tombstone, Ariz., White's City, N. Mex.

Types and paratypes in collection of E. D. Ball, paratypes in U. S. N. M. and Snow Entomological Collection.

52. *Athysanella* (*Gladionura*) *casa* n. sp.

Resembling *alsa*, but with foot of style much broader than at its middle; pygofer with larger hook at apex; plates with sharper apices.

Crown but slightly flattened, margins more rounded; spur on hind tibiae of male about two-thirds as long as first tarsal joint.

General ground color yellowish-green, crown and abdomen often marked with darker areas, venter more or less darkened.

Genitalia. Pygofer narrowed to large, black, radically curved apex; valve slightly shorter than preceding segment, angular; plates wider at base than valve, long, inner margin straight, abruptly converging to long, sharp tips; style enlarged on outer two-thirds, an abrupt tooth near middle on outer margin, enlarged to footlike apex, blunt heel on inner margin, toe on outer; aedeagus slender, in lateral view sides almost parallel, slightly bent dorsally apex excavated from dorsal to ventral margin. Last ventral segment of female about as long as preceding, lateral margin rounded to medium process, posterior margin excavated to a much larger and longer median tooth.

Holotype male, allotype female, 7 pairs paratypes, Flagstaff, Ariz., August 6, 1929, E. D. Ball; other paratypes as follows: 2 males, 3 females, Grand Canyon, Ariz., August, 1930, E. D. Ball; 4 pairs, Lake Mary, Ariz., August 6, 1929, E. D. Ball; numerous specimens, Grand Canyon, Ariz., August 11, 1927, R. H. Beamer; numerous specimens, Flagstaff, Ariz., 1927, R. H. Beamer; numerous specimens, Flagstaff, Ariz., 1936, R. H. Beamer and D. R. Lindsay; other specimens at hand from the following places: Springerville, Ariz., Granite Dell, Ariz., Orton, Utah, Silver City, N. Mex., Grand Junction, Colo., Red Lake, Ariz., Las Vegas, N. Mex., Williams, Ariz., Ash Fork, Ariz., St. Johns, Ariz.

53. *Athysanella* (*Gladionura*) *alsa* n. sp.

Resembling *casa*, but style in lateral view about one-third narrower, outer point longer and more slender, and last ventral segment of female with almost no lateral processes. Length: Male, 3 mm.; female, 4 mm.

Crown flat, margins rather sharp; spine on posterior tibia of male large, about as long as first tarsal segment.

General ground color yellowish-green, dorsum usually without much darker marking, except for light spotting of abdomen, venter often quite dark.

Genitalia. Pygofer of male as mounted on slide narrowed into

avicephaliform apex; valve shorter than preceding segment, angular; plates broader at base than valve, long, outer margin sinuate, inner margin short, rounding to outer in long, slender tip; style enlarged on outer two-thirds, small rounded hump near middle of outer margin, aside from this outer and inner margin almost parallel, with heel and toe apex; aedeagus in lateral view with sides almost parallel, slightly curved dorsally, apex angular from dorsal to ventral margin. Last ventral segment of female about as long as preceding lateral margin rounded, no processes, posterior margin excavated to large, sharp, median point.

Holotype male, allotype female, 4 male and 5 female paratypes, Colfax county, New Mexico, August 21, 1927, R. H. Beamer; types in Snow Entomological Collection.

54. *Athysanella* (*Gladionura*) *emarginata* Osb.

Gladionura emarginata Osborn, H. Ann. Ent. Soc. Am., p. 708, 1930.

Resembling *argentcola,* but male plate truncate at apex and style with bifid tip. Length: Male, 3 mm.; female, 4.5 mm.

Vertex flat, margins rather sharp; spur on hind tibia large, almost as long as first tarsal segment.

Color yellowish-green, vertex sometimes with darker markings; elytra subhyaline, abdomen with semblance of dark longitudinal rows of spots.

Genitalia. Pygofer of male rapidly narrowed to short, black, slightly hooked apex; valve about as long as preceding segment, angular; plates broader at base than valve, slightly longer than wide, sides almost parallel, apex truncate with outer corner longest, covered with black spot; styles enlarged on outer half, varying from almost straight across apex to a bifid tip; aedeagus rather short, in lateral view, with sides almost parallel, slightly curved dorsally, apex sharp, cutaway from dorsal to ventral margin. Last ventral segment of female usually shorter than preceding segment, lateral margins excavated for half their length, posterior margin with tooth at each corner with outer side sloping, inner straight or cut out, middle slightly produced, not usually more than one-third as long as laterals.

Holotype female, Corpus Christi, Tex., H. Osborn. Lectoallotype male, same data, in Osborn Collection.

Specimens are at hand from Texas, Oklahoma, Kansas, Colorado, New Mexico. Some variation has been noted in the depth of excavation in tip of styles.

55. *Athysanella* (*Gladionura*) *furculata* n. sp.

Resembling *emarginata,* but plates rounded, apices not embrowned; apex of styles more evenly and deeply excavated and median lobe on last ventral segment of female much longer than lateral. Length: Male, 3.75 mm.; female, 5 mm.

Vertex flat, margins more or less rounded; spur on hind tibia of male large and strongly curved, about as long as first tarsal segment.

Color cinereous marked with brown; vertex with two diverging dashes at apex, a comma-shaped spot inside each ocellus, typical, indefinite boxlike marks on disc, with short dash near base; pronotum with usual transverse row of small spots; elytra with about six light-brown longitudinal stripes, abdomen with brown spots, more or less in longitudinal rows.

Genitalia. Pygofer narrowed into long, black, slightly curved apices; valve about two-thirds as long as preceding segment, obtusely angulate; plates wider at base than valve, very long inner margin curving to long apices; styles large on outer half, bifurcate, in ventral view outer finger more slender and longer than inner; aedeagus rather short, in lateral view sides almost parallel, apex excavated from ventral to dorsal margin, sharp. Last ventral segment of female slightly longer than preceding, lateral margin rounded, posterior margin slightly excavated to strongly produced middle third, which in turn is often excavated into three distinct teeth or broken off so as to appear not produced. After oviposition the middle portion of this segment may be radically changed.

Holotype male, allotype female, 3 female and 4 male paratypes, Granite Dell, Ariz., July 30, 1933, R. H. Beamer; other paratypes as follows: 3 males and 10 females, Santa Rita Mts., Arizona, August 18, 1935, R. H. Beamer; 1 male, 3 females, Atascosa Mt., Arizona, August 15, 1935, E. D. Ball; 1 male and 5 females, Santa Rita Mts., Arizona, August 8, 1935, E. D. Ball. Types and paratypes in Snow Entomological Collection, paratypes in collection of E. D. Ball.

56. *Athysanella* (*Gladionura*) *rata* n. sp.

Resembling *emarginata,* but smaller, female last ventral segment with lateral projections much longer, with outer margins almost straight, plates of males without dark spot on outer corner and style with inner margin straight and a sharp projection on outer corner. Length: Male, 2.75 mm.; female, 4 mm.

Vertex flat, margins about medium sharp; spur on hind tibia of male long, slightly longer than first tarsal segment.

Color yellowish-green, usually unmarked except for light-brown spots on abdomen.

Genitalia. Pygofer of male narrowed to fairly long, black shaft bent in even curve at apex; valve about as long as preceding segment, angular; plates wider than valve at base, long, sides almost parallel, apex truncate, outer corner the longest, without black spot; styles enlarged on outer half, inner margin straight, apex arcuate, outer corner narrowed into a handlelike process; aedeagus small, in lateral view with sides almost parallel, curving slightly dorsally, apex sharp, hollowed out from dorsal to ventral margin.

Holotype male, allotype female, Faraway Ranch, Arizona, August 24, 1935, Jean Russell; paratypes as follows: 2 males, n. Colorado, April 22, 1898; 15 pairs, same data as types; numerous specimens, Silver City, N. Mex., 1936, R. H. Beamer and D. R. Lindsay; 1 male, St. Johns, Ariz., August 27, 1934, E. D. Ball. Types in Snow Entomological Collection, paratypes in collection of E. D. Ball.

57. *Athysanella* (*Gladionura*) *libera* n. sp.

Resembling *viridia* Osb., but much smaller, not green but with dark flecks, lateral margins of last ventral segment of female without lateral projections and male style with inner fingerlike process angular instead of rounded. Length: Male, 2.75 mm.; female, 4 mm.

Vertex almost flat, margins more or less rounded; spur on hind tibia of male almost as long as first tarsal segment.

Color cinereous with a tinge of green; vertex with more or less darker spots; elytra semihyaline, veins lighter; dorsum of abdomen with usual spots in rows.

Genitalia. Pygofer narrowed into very long slender apices, as in *argenteola,* but slightly curved; valve scarcely as long as preceding segment, obtusely rounded; plates wider at base than valve, long apices almost truncate, outer corner the longest; styles large, bifid, outer branch slender, about two-thirds as long as inner, inner branch about three times as wide as outer, apex angular; aedeagus short, in lateral view converging to sharp apex, ventral margin rounded. Last ventral segment of female about as long as preceding, posterior margin slightly excavate to sharp notch either side a definite median tooth.

Holotype male, allotype female, 10 male and 7 female paratypes, Las Vegas, N. Mex., July 18, 1936, R. H. Beamer; other paratypes as follows: 6 pairs, Silver City, N. Mex., July 22, 1936, D. R. Lindsay; 10 males and 5 females, Silver City, N. Mex., July 22, 1936, R. H. Beamer; 2 pairs, Springerville, Ariz., August 15, 1927, R. H.

Beamer; 1 male, Chiricahua Mts., Arizona, July 4, 1930, E. D. Ball; 2 males, Baboquivari Mts., Arizona, August 29, 1931, E. D. Ball; 4 males and 1 female, Tucson, Ariz., 1936, E. D. Ball. Types and paratypes in Snow Entomological Collection, paratypes in collection of E. D. Ball.

58. *Athysanella* (*Gladionura*) *viridia* Osb.

Gladionura viridia Osborn, H., Ann. Ent. Soc. Am., p. 710, 1930.

Resembling *argenteola*, but larger, style of male bifid at apex and pygofer hooks not so long. Length: Male, 3 mm.; female, 4 mm.

Vertex flat, margins sharp; spur on hind tibia of male short, not much more than one-third as long as first tarsal segment.

Color yellowish-green, with abdomen more or less flecked with small spots.

Genitalia. Pygofer of male narrowed into long, slender black, slightly curved apices; valve slightly shorter than preceding segment, angular; plates broader at base than valve, long, inner margins curving to long outer; styles enlarged on outer half, bifid, inner finger much the largest, evenly rounded, outer very short, narrow, rounded; aedeagus short, in lateral view sides almost parallel, dorsal margin cut away to ventral for sharp apex. Last ventral segment of female about as long as preceding, lateral margins excavated to rounded lobes, posterior margin excavated half-way or more to base with a more or less well-defined tooth at middle.

Holotype female and paratypes in Snow Entomological Collection, allotype in Osborn Collection, paratype in U. S. N. M.

59. *Athysanella* (*Gladionura*) *molesta* n. sp.

Resembling *viridia* Osb., but much smaller, vertex more sharply angled, apices of plates of males blunter, outer fingerlike process of style longer, inner one excavated on inside margin and, therefore, much narrower and not rounded as in *viridia*. Length: Male, 2.5 mm.; female, 3.75 mm.

Vertex almost concave, margins very sharp; spur on hind tibia of male almost half as long as first tarsal segment.

Color yellowish-green with sometimes some darker markings on vertex and dorsum of abdomen.

Genitalia. Pygofer of male narrowed to long, black apices with curved tip; valve slightly more than half as long as preceding, angular; plates broader at base than valve, long, inner margin broadly rounded at apices to rather blunt tips; styles enlarged on outer half,

bifid, outer process narrower and shorter than inner, inner process excavated on inner margin, longer than wide; aedeagus in lateral view of medium length, almost parallel-sided, very slightly curved dorsally, apex excavated from dorsal to ventral margin. Last ventral segment of female shorter than preceding, lateral margins rounded into short processes, posterior margin excavated half its depth, with a semblance of a notch either side of a median tooth.

Holotype male, allotype female, 1 female and 6 male paratypes, George West, Tex., July 4, 1936, R. H. Beamer; 3 males, Texas, 1, C. V. Riley, 2, R. R. Uhler. Types in Snow Entomological Collection.

60. *Athysanella* (*Gladionura*) *adunca* n. sp.

Resembling *sinuata* Osb., but male style with beaklike apex and last ventral segment of female with very long lateral lobes. Length: Male, 3.25 mm.; female, 4.5 mm.

Crown flat, margin rather sharp. Spine on hind tibia of male almost as long as first tarsal segment.

General ground color yellowish-green, usually without much color except a few dark flecks on the abdomen.

Genitalia. Pygofer of male narrowed to black curved tip which under slide resembles outline of an eagle; valve slightly shorter than preceding segment, angular; plates wider at base than valve, short, especially inner margin, apices truncate, outer corner very sharp; styles enlarged on outer half, outer margin deeply excavated just before tip, outline of apex avicephaliform; aedeagus of typical form. Last ventral segment of female slightly longer than preceding, lateral margins rounded into very long processes, posterior margin excavated to base.

Holotype male, allotype female, and numerous paratypes, Baboquivari Mts., Arizona, September 8, 1935, E. D. Ball; numerous paratypes, both sexes, same place, July 19, 1932, R. H. Beamer; 2 pairs, Sabino Canyon, Arizona, June 22, 1933, R. H. Beamer; 1 male paratype, Ajo Mts., Arizona, June 27, 1935, E. D. Ball. Types and paratypes in collection E. D. Ball, paratypes in Snow Entomological Collection.

61. *Athysanella* (*Gladionura*) *sinuata* Osb.

Gladionura sinuata Osborn, H., Ann. Ent. Soc. Am., p. 707, 1930.
Gladionura abbreviata Osb., Ann. Ent. Soc. Am., p. 708, 1930.

Resembling *argenteola,* but with style narrowing at apex and last ventral segment of female almost evenly produced. Length: Male, 2.5 mm.; female, 3.5 mm.

General color yellowish-green, occasionally with dusky marks on crown and abdomen.

Spur on hind tibiae of male about as long as first tarsal segment.

Genitalia. Pygofer of male narrowed to black, avicephaliform apex; valve about as long as preceding segment, angular; plates wider at base than valve, long, sides slightly converging, inner margin rounding to long outer point; styles clavate, apex almost sharp; aedeagus as long as enlarged portion of style, in lateral view ventral margin slightly enlarged on middle third. Last ventral segment of female about a third longer than preceding, posterior margin roundingly produced, slightly trilobed, median lobe about twice as broad as laterals, often not lobed at all.

Lectoholotype male, and lectoallotype female, Garden of the Gods, Colorado, H. Osborn, in Osborn collection.

Other specimens at hand from Kansas, Oklahoma, Wyoming, Montana, South Dakota, New Mexico.

The types of *Athysanella (Gladionura) abbreviata* Osb. have been studied. The type female (holotype), as Professor Osborn says in the original description, is an abnormal individual. The allotype male is larger than the female, something that rarely, if ever, occurs. Numerous specimens like this male have been taken associated with females in Kansas, Texas, Colorado, and New Mexico, and in none of the hundreds of females examined has one been found that could be said to resemble the holotype female of *abbreviata.* It is the conclusion, therefore, that the male allotype is wrongly associated and that the female holotype is an abnormally developed female of *Athysanella (Gladionura) sinuata* Osb., since specimens of this latter species have been examined that resemble quite closely this abnormal individual.

Athysanella (Gladionura) sinuata var. *lobata* n. subsp.

Resembling *sinuata* Osb., but style of male with angled hump on inner side, with excavated portion from it to apex and female last ventral segment more nearly truncate. Length: Male, 2.5 mm.; female, 4 mm.

Vertex flat to slightly rounded, margins more or less rounded; spur on apex of hind tibia more than half as long as first tarsal segment.

Color yellowish-green, often with semblance of darker longitudinal stripes on elytra and spots on abdomen.

Genitalia. Pygofer of male with apex avicephaliform as in *sinuata;* valve about as long as preceding segment, angular; plates

broader at base than valve, long, inner margin rounding to very sharp apices; style enlarged on outer half, inner margin sharply excavated on outer third to rounded narrow apex; aedeagus in lateral view with sides almost parallel, slightly bent dorsally, apex angled from dorsal to ventral margin, blunt. Last ventral segment of female about as long as preceding, lateral margins rounded, posterior margin slightly excavate to a quite large, angular, median projection.

Holotype male, allotype female, numerous paratypes, Santa Fe, N. Mex., May 29, 1935, P. W. Oman; 2 female and 5 male paratypes, Kenna, N. Mex., August 16, 1936, R. H. Beamer.

Paratypes in collection of E. D. Ball, types and numerous paratypes in U. S. N. M. and Snow Entomological Collection.

62. *Athysanella* (*Gladionura*) *lunata* n. sp.

Resembling *sinuata* Osb., but style with inner side of apex deeply excavate and last ventral segment of female definitely three-lobed. Length: Male, 2.75 mm.; female, 4 mm.

Vertex almost flat; margins fairly sharp; spur on hind tibia of male half as long as first tarsal segment.

Color yellowish-green; vertex sometimes with following dark marks: two diverging dashes at apex, a curved dash opposite ocelli; an inverted L on each side of median line and angled dash near base; elytra semihyaline; abdomen often with usual brown spots.

Genitalia. Pygofer narrowed to an avicephaliform apex; valve slightly shorter than preceding segment, angular; plates broader at base than valve, roundingly converging to sharp apices; style enlarged on outer half, inner margin deeply emarginate on outer fourth, outer margin slightly excavated on apical fifth, making apex quite slender; aedeagus of usual type. Last ventral segment of female about as long as preceding, posterior margin definitely trilobed, median lobe as wide as laterals combined.

Holotype male, allotype female, 1 male and 2 female paratypes, Luna, N. Mex., July 25, 1936, R. H. Beamer.

63. *Athysanella* (*Gladionura*) *concava* n. sp.

Resembling *sinuata* Osb., but male style with deep excavation on inner margin at apex, and female last ventral segment with a definite angular, median lobe. Length: Male, 2.5 mm.; female, 3.75 mm.

Vertex flat, margins medium; spur on hind tarsi of male about two-thirds as long as first tarsal segment.

Color yellowish-green, sometimes with faint brown markings on vertex and abdomen.

Genitalia. Pygofer narrowed into definite avicephaliform apex; valve about as long as preceding segment, angular; plates broader at base than valve, long, inner margin rounding to sharp apices; style enlarged on apical two-thirds, inner margin straight to deeply excavated outer fourth, apex rather truncated; aedeagus small, not so definitely humped as in *G. sinuata,* sides almost parallel, apex angled from dorsal to ventral margin. Last ventral segment of female about as long as preceding, lateral angles rounded, posterior margin slightly excavated to large, median process.

Holotype male, allotype female, and numerous paratypes, Mescalero, N. Mex., July 15, 1936, R. H. Beamer, and Cloudcroft, N. Mex., July 14, 1936. Types and paratypes in Snow Entomological Collection and in collection of E. D. Ball and U. S. N. M.

64. *Athysanella* (*Gladionura*) *nacazarana* Osb.

Gladionura nacazarana Osborn, H., Ann. Ent. Soc. Am., p. 711, 1930.

Resembling *argenteola,* but styles much longer than plates, apices of pygofer not nearly so long, and last ventral segment of female with lateral lobes much longer than median. Length: Male, 2.75 mm.; female, 3.75 mm.

Vertex flat, margins quite sharp; spur and hind tibia of male very long, almost as long as first and second segments of tarsi together.

Color yellowish-green, often with usual light-brown markings on vertex and abdomen.

Genitalia. Pygofer narrowed into a medium, long, black point, slightly curved at apex; valve scarcely as long as preceding segment, angular; plates wider than valve at base, long, scarcely narrowed, apices truncate; styles long, projecting beyond plates, slightly narrowed with round, knobbed apices in ventral view; aedeagus short, in lateral view widest near base, dorsal margin cut away from near middle to sharp apex. Last ventral segment of female longer than preceding, lateral margins rounded, posterior margin deeply excavate to a short, rather broad median tooth.

Holotype female, allotype male, Nacazara, Mexico, in Osborn collection. Types studied. Other specimens at hand from the following localities: Santa Rita Mts., Arizona, Baboquivari Mts., Arizona, Patagonia, Arizona, Pearce, Arizona, and Santa Cruz river, Arizona.

65. *Athysanella (Gladionura) clavata n.* sp.

Resembling *argenteola* (Uhl.), but color gray with dark markings; plates with apices truncate or slightly excavated, instead of rounded, styles with outer half heavier, apices nearer truncate, with larger projection on outer margin, and last ventral segment of female protruding instead of excavated. Length: Male, 3.5 mm.; female, 5 mm.

Vertex almost flat, margins quite rounded; spur on hind tibia of male short, less than half as long as first tarsal segment.

Color cinereous, heavily marked with fuscous; vertex with two diverging dashes at apex, more or less united, transverse, curved mark opposite ocellus, inverted L on each side of middle line and spot at base; pronotum more or less infuscated; elytra usually with brown longitudinal stripes, and abdomen with usual brown spots in longitudinal rows.

Genitalia. Pygofer of male narrowed into a long, black, curving apex; valve shorter than preceding segment, angular; plates broader at base than valve, long, margins scarcely narrowing, apices almost truncate, outer, or dorsal, corner much longer; styles clavate in dorsal or ventral view with two rounded projections on outside margin, apical one about twice as large as other; aedeagus in lateral view short, sides almost parallel, apex angled from dorsal to ventral margin. Last ventral segment of female about as long as preceding, lateral margin cut away at edge of preceding segment to small lateral tooth, posterior margin excavated between these.

Holotype male, allotype female, 2 male and 8 female paratypes, Nogales, Ariz., 1933, E. D. Ball; other paratypes as follows: numerous specimens, Baboquivari Mts., Arizona, E. D. Ball, 1935; 18 males and 7 females, Patagonia, Ariz., June 24, 1933, R. H. Beamer; 13 males and 12 females, Patagonia, Ariz., June 24, P. W. Oman; other specimens from the following localities: Blue Springs, N. Mex., Chiricahua Mts., Arizona, Nogales, Ariz., Tucumcari, N. Mex., Concan, Tex. The specimens from this last locality are slightly different, but so close that another species is not justified.

Types in collection of E. D. Ball, paratypes in U. S. N. M. and Snow Entomological Collection.

66. *Athysanella (Gladionura) directa* n. sp.

Resembling *diversa*, but style with inner margin straight to apex, not excavated on outer third, and female last ventral segment with definite lateral processes. Length: Male, 2.5 mm.; female, 4 mm.

Vertex flat, margins medium; spur on hind tibia of male about two-thirds as long as first tarsal segment.

Color yellowish-green, occasionally with semblance of darker marks on vertex.

Genitalia. Pygofer of male narrowed to short, black, curved apices; valve as long as preceding segment, sharply angular; plates wider at base than valve, long, sides almost parallel, apices truncate, dorsal margin slightly longer; style enlarged on outer half, inner margin even, slightly curving in, outer margin narrowed on outer third to truncate apex; aedeagus in lateral view with sides almost parallel, slightly curved dorsally, apex rather blunt, excavated from ventral margin. Last ventral segment of female not much more than half as long as preceding, lateral margin rounded into definite processes, posterior margin excavated to broad median projection, not as long as laterals.

Holotype male, allotype female, 19 pairs paratypes, Rocksprings, Tex., July 9, 1936, R. H. Beamer and M. B. Jackson; other paratypes as follows: 2 males and 1 female, San Antonio, Tex., July 4, 1936; one pair, Sabinal, Tex., July 6, 1936, D. R. Lindsay; 7 males and 5 females, Concan, Tex., 1 male, Castroville, Tex., D. R. Lindsay; 5 pairs, Leakey, Tex., July 8, 1936, R. H. Beamer.

Types and paratypes in Snow Entomological Collection, paratypes in collection of E. D. Ball and U. S. N. M.

67. *Athysanella* (*Gladionura*) *nigriventralis* n. sp.

Resembling *contracta,* but venter quite dark, inner margin of style not excavated and lateral processes of last ventral segment of female much longer than median. Length: Male, 3 mm.; female, 4 mm.

Vertex flat, margins medium; spur on hind tibia of male long and curved, longer than first tarsal segment.

Color yellowish-green, usually with the following dark marks; vertex with two diverging dashes at apex, a curved dash extending in from ocellus, boxlike mark on each side of disc and an angled dash on each half next base; each segment of dorsum usually with a transverse row of very fine brown spots; venter usually almost entirely black.

Genitalia. Pygofer of male narrowed into a black, generally curving apex; valve about as long as preceding segment, angular; plates broader than valve at base, sides almost parallel, apex almost truncate, dorsal corner longest; style enlarged on outer half, outer margin excavated on outer third, inner margin almost straight; aedeagus in lateral view with sides almost parallel, very slightly curved dorsally, apex angulate from dorsal to ventral. Last ven-

tral segment of female about as long as preceding, lateral margins produced into long rounded lobes, posterior margin excavated almost to base, with slight bulging at middle.

Holotype male, allotype female, 11 male and 9 female paratypes, Silver City, N. Mex., July 22, 1936, R. H. Beamer and D. R. Lindsay; 8 male and 8 female paratypes, Frijole, Tex., July 16, 1933; 1 male, Carlsbad Cavern, N. Mex., 1934, E. D. Ball.

Types in Snow Entomological Collection, paratypes in collection of E. D. Ball.

68. *Athysanella* (*Gladionura*) *dentata* n. sp.

Resembling *clavata,* but last ventral segment of female with posterior margin smooth on lateral third, style with lateral process near tip almost as broad as width of shaft, and aedeagus covered with numerous minute pegs on outer two-thirds. Length: Male, 4 mm.; female, 5.5 mm.

Vertex flat, margin medium; spur on hind tibia of male as long as first tarsal segment, curved.

Color cinereous, often with a yellowish-green tinge, often with semblance of brown markings throughout.

Genitalia. Pygofer narrowed into a large, black, evenly curved apex; valve about as long as preceding segment, angular; plates wider at base than valve, sides almost parallel, apex truncate, dorsal margin longest; style enlarged on outer two-thirds, outer margin with large bump just before apex; aedeagus in lateral view of moderate length, sides almost parallel, apex angled from dorsal to ventral margin, ending in small hook, outer two-thirds with numerous small peglike structures. Last ventral segment of female scarcely as long as preceding, posterior margin rounded from base to small definite notch either side a short, blunt median tooth.

Holotype male, allotype female, 4 male and 5 female paratypes, Durango, Colo., July 2, 1933, P. W. Oman; numerous paratypes, same locality, R. H. Beamer, July 4, 1937.

Types in U. S. N. M., paratypes in Snow Entomological Collection and collection of E. D. Ball.

69. *Athysanella* (*Gladionura*) *excavata* (Osb.)

Athysanella excavata Osborn, H., Ann. Ent. Soc. Am., XXIII, p. 704, 1930.

Resembling *argenteola* (Uhler), but distinctly larger, and female last ventral segment deeply excavated. Length, 3-5 mm.

General color grayish or yellowish-green in dry specimens, living specimens iridescent green. Slight dark markings often present on crown and abdomen.

Crown rather flat and sharp; spur on hind tibia of male less than half as long as first segment of tarsi.

Genitalia. Posterior margin of last ventral segment of female with lateral angles sharp, deeply excavated on middle two-thirds, with small median tooth usually barely showing past penultimate segment.

Male pygofer narrowed to long, black, curving apex; valve about same length as the preceding segment, angular; plates wider than valve at base, long, sides but slightly narrowed to blunt apices, longest on dorsal margin; style enlarged on outer half, inner margin slightly excavated near middle, rounding toward outer on outer fourth, outer margin with slight excavation either side of a median projection, giving a slight trilobed appearance; aedeagus of normal type.

The allotype male described above and numerous parallotypes, Boca Chica, Tex., June 30, 1938, R. H. Beamer, are here designated. One parallotype, same place 1933, P. W. Oman.

The holotype female, San Antonio, Tex., has been studied in addition to numerous specimens, both male and female, collected this past summer (1938) at Boca Chica, Tex.

The species was named from females only, hence was placed in the wrong subgenus.

70. *Athysanella (Gladionura) curvata* n. sp.

Resembling *contracta* n. sp., but apices of male plates longer and more slender, on a slide the styles curve in instead of out, pygofer hooks much longer and heavier, extending out and up and the last ventral segment of the female, although shaped much the same has larger lateral projections and a truncated median projection that is much shorter than the laterals. Length: Male, 3 mm.; female, 4 mm.

Vertex slightly excavated, margins sharp; spur on hind tibia of male about two-thirds as long as first tarsal segment.

Color yellowish-green, usually without dark markings.

Genitalia. Pygofer of male narrowed to very long, heavy straight projections, extending out and dorsally; valve scarcely as long as preceding segment, obtusely angled; plates wider than valve at base, sides almost parallel, scarcely touching on mesal margin, apices narrowed to very long outer points; style thickened on outer two-thirds, on the slide, curving in with outer margin smooth, an angular projection near middle of inner margin and apex strongly contracted; aedeagus typical of most species in this genus, slightly tapered to-

ward apex in lateral view. Last ventral segment of female about as long as preceding, lateral angles excavated to rather broad processes, posterior margin excavated from these processes to a broad truncate median projection about half as long as laterals.

Holotype male, allotype female, and numerous paratypes, Little Beaver Creek, Colorado, July 11, 1937, R. H. Beamer and C. L. Johnston, at a point not far from Pingree Park, Colorado. Types and paratypes in Snow Entomological Collection.

71. *Athysanella* (*Gladionura*) *contracta* n. sp.

Resembling *argenteola* (Uhler), but style of male contracted to half greatest width and posterior margin of last ventral segment of female with inward, projecting lateral lobes, and large median lobe as long as laterals. Length: Male, 3 mm.; female, 4 mm.

Vertex flat, margins medium; spur on hind tibia of male long, curved, reaching about to apex of first tarsal segment.

Color yellowish-green, sometimes with a semblance of darker marks on vertex and abdomen.

Genitalia. Pygofer of male narrowed to rather short, black, slightly curved apex; valve little more than half as long as preceding segment, obtusely angled; plates wider at base than valve, very long especially on outer margin, inner margin roundingly narrowed to long, slender apices; styles enlarged on outer two-thirds, widest near middle, contracted on outer fourth to half greatest width; aedeagus short, without specific value. Last ventral segment of female about as long as preceding, lateral margins roundingly excavated, posterior margin deeply excavated either side a large median lobe, lateral lobes projecting inward.

Holotype male, allotype female, 2 male and 9 female paratypes, Osborne, Kan., September 9, 1936, R. H. Beamer; other paratypes as follows: 6 males and 4 females, Scott county, Kansas, State Park, August 21, 1936, R. H. Beamer; 4 pairs, Slade, Kan., September 9, 1936, M. E. Griffith; 1 pair, Dickinson county, Kansas, R. H. Painter; 2 males, Ellsworth county, Kansas, D. A. Wilbur; 7 males and 14 females, Seymour, Tex., June 30, 1936, R. H. Beamer; 6 males, 4 females, Yarnell Hts., Arizona, 1929, E. D. Ball; 3 males, 2 females, Santa Rita Mts., Arizona, 1931, E. D. Ball; 1 male, 7 females, Patagonia, Ariz., E. D. Ball; 3 males, 1 female, Huachuca Mts., Arizona, July 14, 1934, E. D. Ball. Other specimens at hand from Loveland, Colo., Waynoka, Okla., Fox Ridge, S. Dak., Cappa, S. Dak., Ashfork, Ariz., Silver City, N. Mex., Frijole, Tex.

72. *Athysanella* (*Gladionura*) *sagittata* n. sp.

Resembling *contracta,* but larger, male styles more enlarged, with apex rounded instead of truncated, and median process of last ventral segment of female at least three times as broad as laterals. Length: Male, 4 mm.; female, 5 mm.

Vertex flat, margins medium; spur on hind tibia of male as long as first tarsal segment, curved.

Color cinereous, with a yellowish-green tinge, usually with a semblance of brown spots on vertex and usual rows on abdomen.

Genitalia. Pygofer of male narrowed to rather short, black, curved, apex; valve slightly shorter than preceding segment, angular; plates broader at base than valve, very long, inner margin broadly rounded to long, slender apices; styles enlarged on outer half, apices narrowed, rounded, somewhat sagittate in shape; aedeagus in lateral view with sides almost parallel, slightly curved dorsally, apex excavated from dorsal to ventral margin, with hook at tip. Last ventral segment of female about as long as preceding, lateral angles with rather long processes, posterior margin excavated almost to base, with very broad median projection, often with a semblance of a notch either side of middle.

Holotype male, allotype female, 13 male and 7 female paratypes, Hurley, N. Mex., August 25, 1935, R. H. Beamer; other paratypes as follows: 1 male, Douglas, Ariz., June 10, 1936, E. D. Ball; 11 males, 22 females, Pearce, Ariz., August 23, 1935, R. H. Beamer; 12 males, 12 females, Mustang Mt., Arizona, August 22, 1935, R. H. Beamer; numerous specimens Elkins, N. Mex., 1936, R. H. Beamer and D. R. Lindsay.

Types in Snow Entomological Collection, paratypes in collection of E. D. Ball and U. S. N. M.

73. *Athysanella* (*Gladionura*) *arcana* n. sp.

Resembling *argenteola,* but styles projecting beyond plates and pygofer hooks much shorter. Length: Male, 3 mm.; female, 4 mm.

Vertex flat, margins angular; spur on hind tibia of male as long as first tarsal segment.

Color variable from buff to yellowish-green, often with darker marks on vertex and abdomen; elytra often with veins lighter.

Genitalia. Pygofer of male narrowed to short, black, very slightly curved apex; style about as long as preceding segment, angular; plates wider at base than valve, long, slightly narrowed to bluntly rounded apices; style protruding, enlarged on outer two-thirds,

rounded hump near middle of outside margin, apex in form of dogs' head, nose in; aedeagus in lateral view short, sides almost parallel, slightly curved dorsally, apex excavated from dorsal to ventral margin. Last ventral segment of female almost hidden beneath the preceding, posterior margin barely showing on lateral margins, slightly wider near middle.

Holotype male, allotype female, and numerous paratypes, 47 miles west, Sheffield, Tex., July 10, 1936; other paratypes as follows: numerous specimens, Marfa, Tex., August 7, 1936, E. D. Ball; 2 males and 1 female, Otero county, New Mexico, June 17, 1929, R. H. Painter; 1 male, Chiricahua Mts., Arizona, June 9, 1933, P. W. Oman; other specimens are at hand from the following localities: Wilcox, Ariz., Rodeo, Ariz., Ozona, Tex., White's City, N. Mex., Fort Stockton, Tex., Hurley, N. Mex.

Types in Snow Entomological Collection, paratypes in U. S. N. M. and collection of E. D. Ball.

74. *Athysanella* (*Gladionura*) *argenteola* (Uhler)

Deltocephalus argenteolus Uhler, P. R., Bul. U. S. Geol. Survey, iii, p. 473, 1877.

This is one of the commonest leaf hoppers in the short grasses of the western plains. It is characterized by its golden green color, which becomes yellowish-green after death; plates long with rounded apices, styles clavate, about as long as plates; pygofers narrowed into very long, slender, black spines, hooked at tips.

Vertex flat, margins medium; spur on hind tibia of male as long as first tarsal segment.

Color yellowish-green, often marked with fuscous on vertex and abdomen.

Genitalia. Pygofer of male with apical portion about one-third as long as whole, very slightly curved; valve about as long as preceding segment, angular, plates at base wider than valve, long, narrowing slightly to just before apex, when inner margin curves rapidly to meet outer; styles about as long as plates, apices rounded, flat, notch on outer margin one-third distance from tip; aedeagus rather short, curving slightly, apex sharp. Last ventral segment of female about as long as preceding, lateral angles excavated on outer half, posterior margin broadly excavated from rounded lateral corners to broadly rounded median portion just shorter than lateral lobes.

Lectoholotype, macropterous female, labeled in Uhler's handwriting as follows: "Colo. Sp. 13/8." and allotype male, Peyton, Colo., August 19, 1936, R. H. Beamer, are here designated. Holo-

type in U. S. N. M., allotype in Snow Entomological Collection. Specimens at hand from Kansas, Texas, New Mexico, Arizona, Colorado, Wyoming, South Dakota, Oklahoma, Nebraska.

75. *Athysanella* (*Gladionura*) *diversa* n. sp.

Resembling *contracta,* but style with inner margin concave on outer third and outer margin convex, and female last ventral segment with posterior margin without lateral processes, and very large median projection. Length: Male, 3.5 mm.; female, 5 mm.

Vertex flat, margins sharp; spur on hind tibia of male about as long as first tarsal segment. Color yellowish-green, often marked with fuscous on vertex and abdomen.

Genitalia. Pygofer of male narrowed into a short, black apex with slight hook; valve about as long as preceding segment, angular; plates broader at base than valve, very long, sides almost parallel, inner margin rounded to rather blunt apices; styles enlarged on outer two-thirds, inner margin concave on outer third, outer margin convex just opposite; aedeagus rather short, in lateral view sides almost parallel, apex sharp, excavated from dorsal to ventral margin. Last ventral segment of female about as long as preceding, at lateral margins scarcely extending beyond preceding segment, posterior margin strongly produced at middle.

Holotype male, allotype female, and numerous paratypes, Yarnell, Ariz., July 29, 1933, R. H. Beamer, 6 pairs paratypes, Yarnell Hts., Arizona, October 4, 1929, E. D. Ball. Types and paratypes in Snow Entomological Collection, paratypes in collection of E. D. Ball.

Brachydella, new subgenus

Like *Gladionura* but with vertex very flat, almost concave, with margin rounded from eye to eye, meeting front in very thin, almost foliaceous margin. Pygofer narrowed into long hook, and male with long spur on hind tibia. The type of subgenus is *Athysanella* (*Brachydella*) *abdominalis* n. sp.

76. *Athysanella* (*Brachydella*) *abdominalis* n. sp.

Resembling the species of *Gladionura,* but larger and more slender with the very flat vertex and extremely sharp margins. Length: Male, 4.5 mm.; female, 6.5 mm.

Vertex wider than long, flat to concave, margin rounded from eye to eye, very sharp, almost foliaceous; head wider than pronotum; elytra short, exposing seven abdominal segments, apices slightly

rounded, venation indefinite; abdomen long, narrow, female with sharp extended ovipositor; males with large spur on hind tibia, about two-thirds as long as first tarsal segment.

Color cinereous with fuscous markings; vertex with three black spots on margin, a cross row of four longitudinal dashes near middle and a semblance of two pairs of dashes at base; pronotum with six longitudinal stripes, middle pair ending on scutellum; elytra with a semblance, at least, of dark longitudinal stripes with light veins; abdomen usually with six longitudinal stripes, the laterals often broken into a spot on each segment; venter varies from black to dark spotted.

Genitalia. Last ventral segment of female of about same length as preceding; posterior margin with slight lateral lobes, slightly excavated most of its breadth, with three short lobes at middle, the central one much broader than laterals. Valve of male shorter than preceding segment, angular; plates broader at base than valve almost three times as long, outer margins converging to sharp apices Pygofer of male narrowed on outer third to long black hook; style short not reaching middle of plates, outer third curved dorsally on ventral margin, with a large notch on dorsal margin; aedeagus in lateral view widest on basal half, slightly curved dorsally on apical third.

Holotype male, allotype female, Santa Rita Mountains, Arizona, August 18, 1935, E. D. Ball. Paratypes as follows: one pair, same data as types; 1 male, Atascos Mountain, Arizona, August 16, 1935, E. D. Ball; 20 males and 17 females, Santa Rita Mountains, Arizona, August 18, 1935, R. H. Beamer.

Types and paratypes in collection of E. D. Ball. Paratypes in U. S. N. M. and Snow Entomological Collection.

Pedumella, new subgenus

Like *Athysanella,* but male with no spur on apex of hind tibia and pygofer narrowed to a black hook. Type of the subgenus *Athysanella (Pedumella) spatulata* n. sp.

Key to Species of Subgenus Pedumella

Outer third of style of male enlarged, flattened, pygofer narrowed into a long, black, sickle-shaped process; posterior margin of last ventral segment of female with definite lateral lobes ..... *spatulata*, p. 66

Outer third of style with right-angled notch in dorsal margin; pygofer narrowed into a short process bent at right angles; posterior margin of last ventral segment of female without lateral lobes ..... *recurvata*, p. 66

77. *Athysanella (Pedumella) spatulata* n. sp.

Resembling *recurvata*, but outer third of male style spatulate without the narrowed ventral apical process. Length: Male, 3 mm.; female, 4.5 mm.

Vertex concave, margins sharp; styles visible externally.

Color cinereous; some specimens with a semblance of usual dark markings on vertex, pronotum, and elytra; dorsum of abdomen with cross rows of spots and a semblance of the longitudinal stripes.

Genitalia. Pygofer of male narrowed into large, black, evenly curved, sickle-shaped apex; valve longer than last ventral segment, broadly angular; plates broader at base than valve, long, slightly converging to blunt apices; style spatulate on outer third, apex truncate; aedeagus in lateral view, long, slender, slightly curved dorsally, excavated ventral to dorsal to sharp apex. Last ventral segment of female longer than preceding, lateral margins rounded to definite lateral lobe, posterior margin sharply excavated to a short, rounded median lobe.

Holotype male, allotype female, and 9 male paratypes, St. John, Ariz., July 26, 1936, R. H. Beamer; paratypes as follows: one male, Hurley, N. Mex., August 25, 1935, R. H. Beamer; 7 males, Marathon, Tex., July 9, 1938, R. H. Beamer. Types in Snow Entomological Collection.

78. *Athysanella (Pedumella) recurvata* (Osb.)

Gladionura recurvata Osborn. Ann. Ent. Soc. Am., Vol. 23, 1930, p. 706.

Resembling *lunata*, but without a spur on hind tibia and female last ventral segment without lateral lobes on posterior margin. Length: Male, 3.5 mm.; female, 5 mm.

Vertex flat, margins angular; styles visible externally; no spur on hind tibia of male.

Color yellowish-green, very faintly marked, if at all; an occasional specimen with diverging dashes at apex of vertex and semblance of other marks; pronotum with semblance of cross row of dots; dorsum of abdomen with four cross rows of dots and an occasional specimen with longitudinal stripes.

Genitalia. Pygofer of male narrowed to a thick, black point bent at right angles; valve about as long as preceding segment, obtusely angular; plates wider at base than valve, long, inner margin rounding to long slender tips; style enlarged on outer two-thirds, apex greatly narrowed for space about equal to width at middle; aedeagus in lateral view widest on basal two-thirds, apex angled from

dorsal to ventral margin, ventral margin slightly serrate. Last ventral segment of female hidden beneath preceding at margin, produced into an angular tooth at middle.

Since the type of this species is lost, a female neoholotype and male allotype, Ashfork, Ariz., August 16, 1929, E. D. Ball, described above, are here designated. In collection of E. D. Ball.

Specimens are at hand from the following localities: Painted Desert, Ariz., Lupton, Ariz.; Williams, Ariz.; Kanab, Utah; Chads, Utah; Provo, Utah; Westwater, Colo.; Grand Junction, Colo.; Elsinore, Utah; White's City, N. Mex.; St. Johns, Ariz.

Gillettiella Osb.

This genus is characterized by the conical head, rather short elytra, long ovipositor, and male genitalia of the type more often found in other genera of leaf hoppers than in Athysanella. The type of the genus is *Gillettiella labiata* (Gill.).

Key to Species of Gillettiella

1. Apex of vertex with round black spot 2
   Apex of vertex without round black spot ..... *labiata*, p. 67
2. Vertex very sharp, sides almost straight, markings broad ..... *atropunctata*, p. 68
   Vertex much blunter, margins rounded, markings narrow ..... *fasciata*, p. 69

79. *Gillettiella labiata* (Gill.)

Deltocephalus labiata Gillette, Colo. Exp. Sta. Bull. 43, p. 26, 1898.
Deltocephalus labiata var. *rufus* Gillette, Colo. Exp. Sta. Bull. 43, p. 26, 1898.

Easily separated from other members of this genus by the lack of intense black spot on apex of vertex. Length: Male, 2.5 mm.; female, 4 mm.

Vertex rounded, margins rounded to front; elytra short, exposing about five abdominal segments, hind margin truncate most often, but may vary to pink.

Color cinereous, female with a semblance of dark spots on abdomen and vertex; male with three pairs of spots, angular at apex, rectangular on disc and rounded at base; pronotum with transverse row of dark spots anteriorly; elytra dark with veins lighter and light cross band at tips with apical cells darker; abdomen dark brown except next to last segment, which is light with transverse row of brown spots and a median, longitudinal, light stripe.

Genitalia. Pygofer of male slightly narrowed to rounded apex; valve longer than preceding segment, angular, apical third more acute; plates wider at base than valve, narrow, slightly longer than valve, inner margin almost straight, outer rounded to sharp apices;

style broad on basal half, outer third very narrow, sides almost parallel, curved out; aedeagus in lateral view long and slender, bent dorsally at about a right angle near basal fourth, sides almost parallel, slightly converging. Last ventral segment of female broader than preceding, lateral margin rounded to small lateral process, posterior margin excavated to a broad median eminence as long as laterals.

Types in collection of Colorado Agricultural College. Specimens at hand from Kansas, Oklahoma, Texas, New Mexico, Arizona, Colorado, Nebraska, South Dakota, Wyoming.

This is a very common, widespread species, often varying in color with the type of soil. So variable is the general color that to use the varietal name *rufus* would be confusing.

80. *Gillettiella atropunctata* (Gill.)

Deltocephalus atropunctata Gillette, C. P., Colo. Exp. Sta. Bull. 43, p. 28, 1898.

Resembling *labiata*, but smaller and with very black spot on apex of vertex. Length: Male, 2 mm.; female, 4 mm.

Vertex sharp, disc rounded, margins rounded to front, about twice as long as distance between eyes.

Color cinereous, with dark markings as in *labiata*, but more extended and darker with the small, very black spot on apex of vertex.

Long-winged female is much larger than the short-winged female; elytra with two cross-nervures and more rounded apices and veins light with cells embrowned.

Genitalia. Pygofer of male with sides almost parallel, apex broadly rounded; valve as long as preceding segment, apex sharply angled; plates broader at base than valve, inner margins contiguous, outer margin rounded to medium sharp apices; style greatly narrowed on outer third, bent out at 45 degrees; aedeagus in lateral view bent dorsally in semicircle, long and slender. Last ventral segment of female longer than preceding, posterior margins rounded to small lateral processes, posterior margin slightly excavated from lateral processes to very broad, rounded middle portion of about same length as lateral portions.

Lectoholotype female, Fort Collins, Colo., September 27, C. P. Gillette; allotype male, Fort Collins, Colo., May 29, 1898. This species is at hand from the following states: Colorado, Arizona, New Mexico, Texas, Oklahoma, Kansas. Our collecting would indicate a heavier population of this species in Texas.

81. *Gillettiella fasciata* n. sp.

Resembling *atropunctata,* but much larger, vertex blunter with two dark cross bands and two longitudinal stripes on thorax. Length: Male, 2.5 mm.; female, 4.25 mm.

Vertex highly arched, margins rounded, slightly longer at middle than width between eyes; elytra exposing about three abdominal segments, apices rounded.

Color cinereous; vertex with a round black apical spot, two darker cross bands indicated on disc, with an indication of two converging stripes on basal half, continuing across pronotum to end on scutellum; dark stripe on pronotum back of each eye; elytra darker with veins lighter; dorsum of abdomen with indication of three pairs of brown longitudinal stripes.

Genitalia. Pygofer of male narrowed to bluntly rounded apices; valve of male angular with outer third sharply angled, plates wider at base than valve, about as long as valve, margins rounded to almost an oval shape; style with outer third very narrow, bent out and serrated on outer margin; aedeagus in lateral view long and narrow, bent dorsally at about a right angle, gradually narrowed to sharp apex. Last ventral segment of female about as long as preceding, lateral margins rounded to a shallowly excavate posterior margin.

Holotype male, allotype female, and one female paratype, Santa Fe, N. Mex., June 29, 1935, P. W. Oman; one paratype female, 5.7 miles west of Grady, N. Mex., June 28, 1929, *Salsola pestifer.* Types in U. S. N. M.

The Genus Doratura Boh.

Usually short-winged, vertex round from eye to eye, margin sharp, disc excavated, male genitalia small compared to Athysanella, extending but slightly beyond last abdominal segment, more like that of Lonatura in this respect. The genotype is *D. stylata* Boh.

Only one species of this genus has been found in this country and it is identical with *Doratura stylata* Boh. of Europe, except smaller.

82. *Doratura stylata* (Boh.)

Athysanus stylatus Boheman, C. H. K., Vet. Ac. Handl., 1847.

Resembling *Brachydella abdominalis* in the shape and sharpness of vertex, but much smaller, lacks the spur on hind tibia and plates are almost truncate. Length: Male, 3.5 mm.; female, 4 mm.

Vertex wider between eyes than median length, usually quite

rounded from eye to eye, margin sharp, disc excavated at least just back of margin, elytra of short-wing forms exposing six abdominal segments, truncate, venation obscure in long-winged females, extending almost to tip of ovipositor; hind wings mere pads in former and normal length in latter. In dorsal view body widest in region of second abdominal segment. Female ovipositor about as in *Athysanella*. Male genitalia smaller, superficially resembling *Lonatura*.

Color tawny, marked with black; face with two black cross stripes; vertex margin with three black spots, median larger, more or less rectangular, disc with semblance of boxlike spot; pronotum with semblance of crossrow of darker spots; dorsum of abdomen with semblance of six longitudinal stripes, often with a narrow, lighter median stripe; venter with two black cross bands on face; females with segments of abdomen more or less infuscated, those of males with large black lunate cross spot occuping a large portion of each sclerite.

Genitalia. Pygofer of male short, rectangular; valve short, obtuse, barely visible externally; plates broad at base, sinuately narrowed on outer margin to broadly rounded apices; aedeagus in lateral view broad on basal half, bent dorsally just before middle and much narrowed to apex; styles with peculiar flaplike process near attachment to plates, slightly broadened for about one-fourth distance to tip, then sharply bent dorsally and narrowed to long, slender, curving apices.

Numerous specimens are at hand from Wisconsin, Michigan and Massachusetts. Long-winged females are fairly common.

There is apparently no difference in the specimens in this country and those in Europe except these are smaller in size. The internal genitalia of the male are alike too, except smaller.

PLATE I

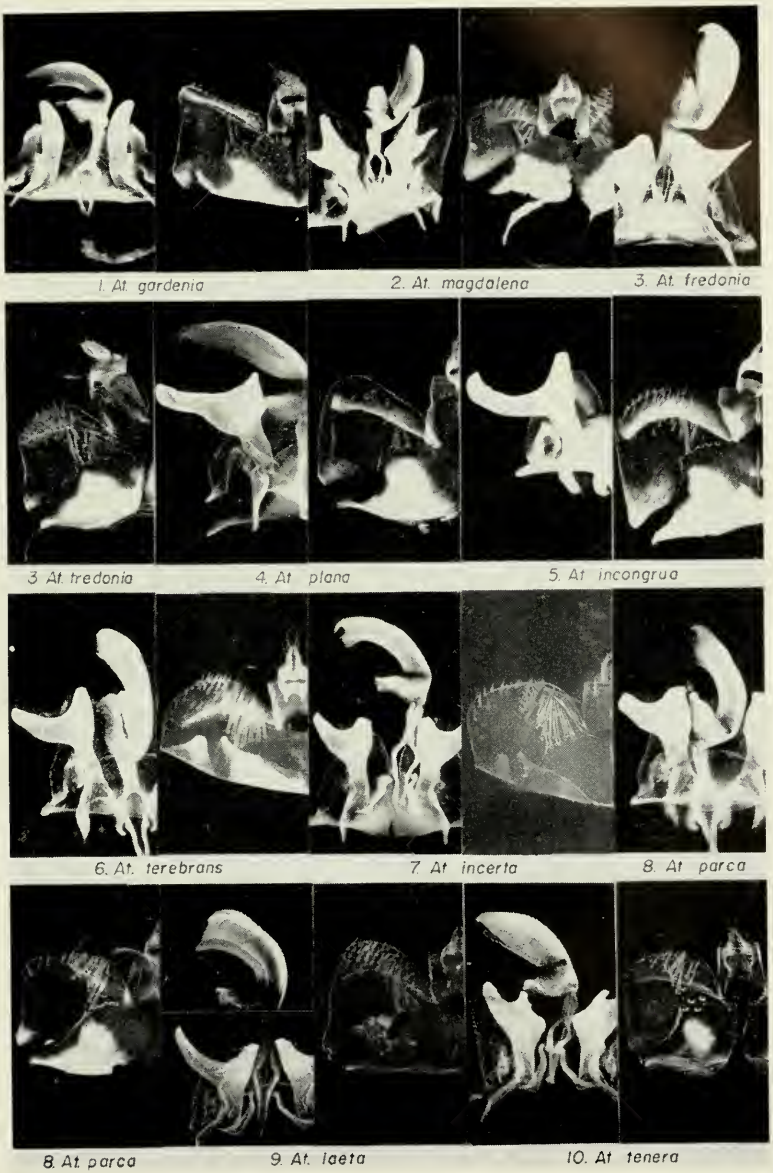
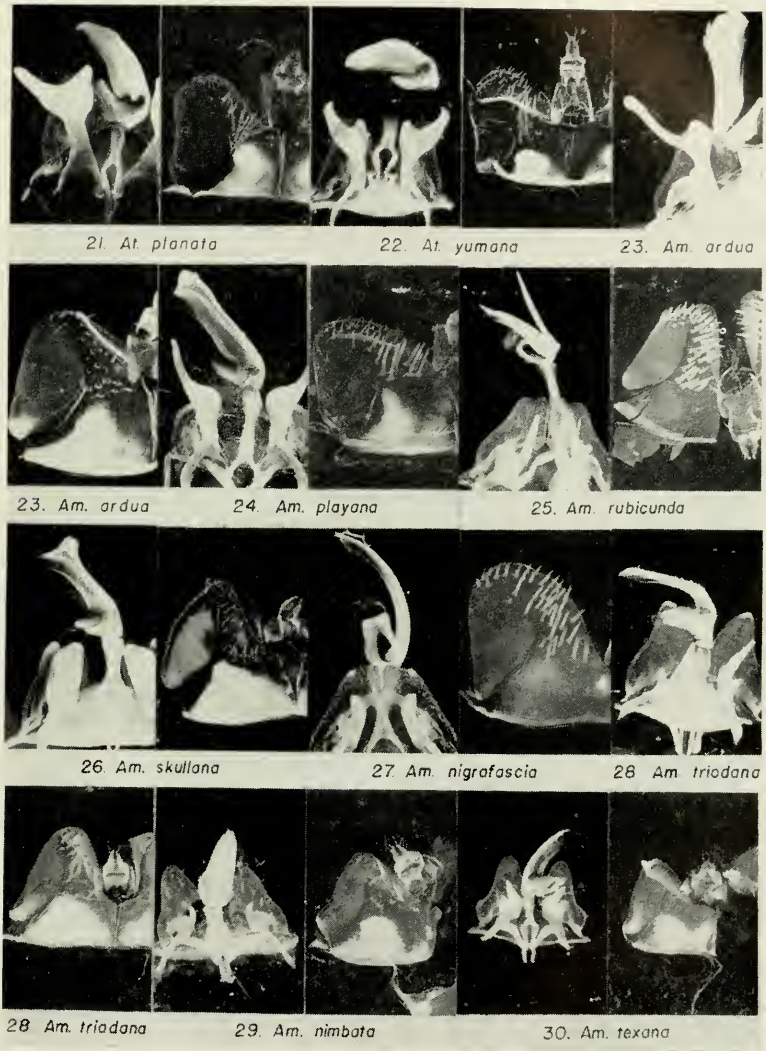

1. At. gardenia
2. At. magdalena
3. At. fredonia
3 At. fredonia
4. At plana
5. At incongrua
6. At. terebrans
7 At incerta
8. At parca
8. At. parca
9. At. laeta
10. At tenera

PLATE II

11 At aspersa
12. At robusta
13. At globosa
13. At. globosa
14 At. foeda
15. At kanabana
16. At salsa
17. At. rostrata
18. At. utahna
18. At utahna
19. At supina
20. At. bifida

PLATE III



21. At. planata 22. At. yumana 23. Am. ardua

23. Am. ardua 24. Am. playana 25. Am. rubicunda

26. Am. skulliana 27. Am. nigrofascia 28. Am. triodana

28. Am. triodana 29. Am. nimbata 30. Am. texana

PLATE IV

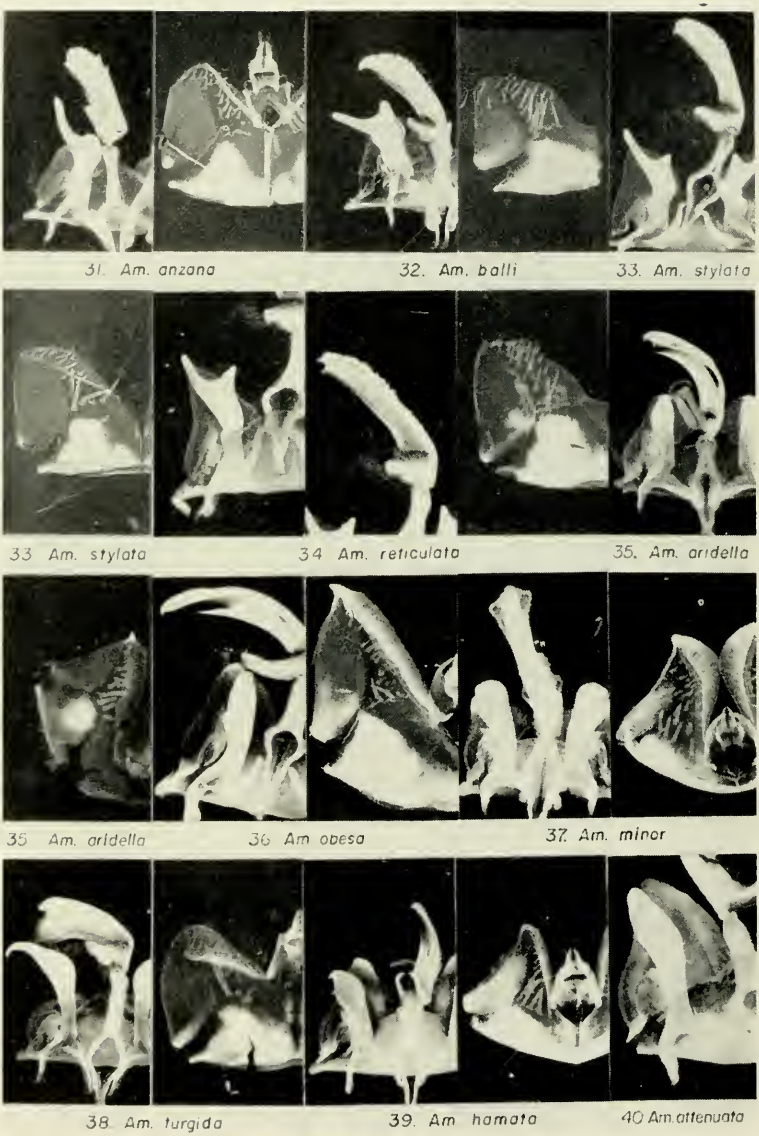
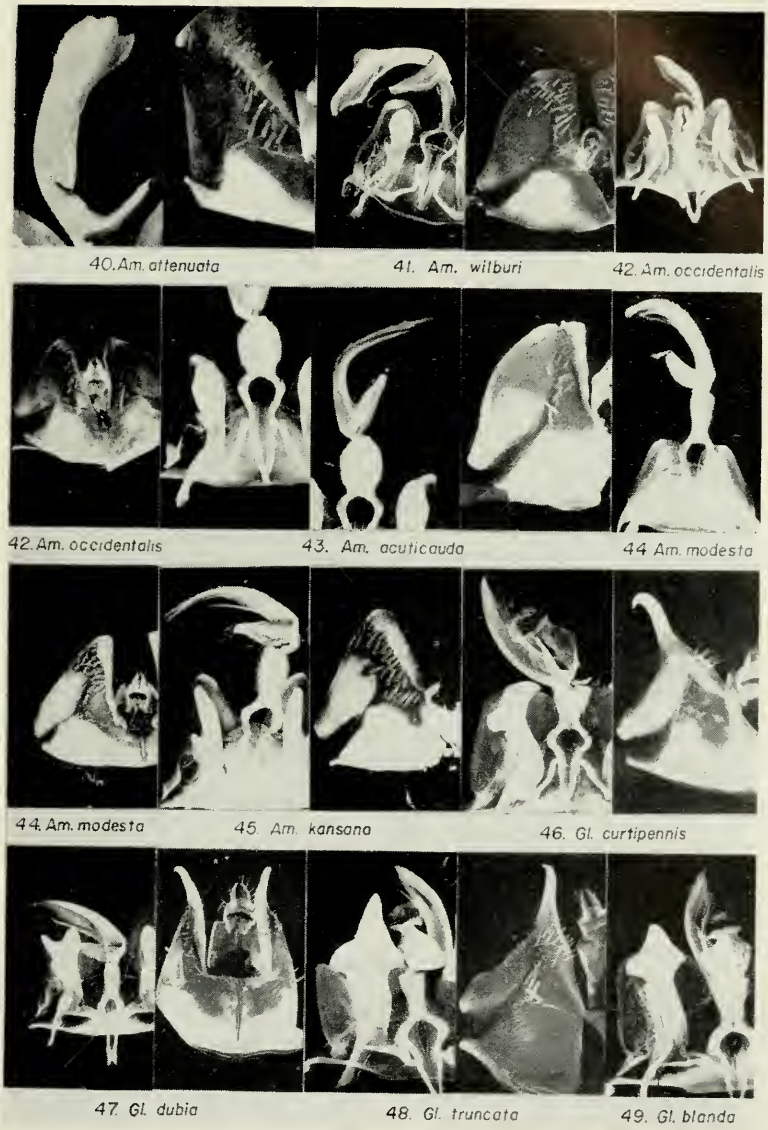

31. Am. anzana
32. Am. balli
33. Am. stylata
33 Am. stylata
34 Am. reticulata
35. Am. aridella
35 Am. aridella
36 Am obesa
37. Am. minor
38. Am. turgida
39. Am hamata
40 Am attenuata

PLATE V



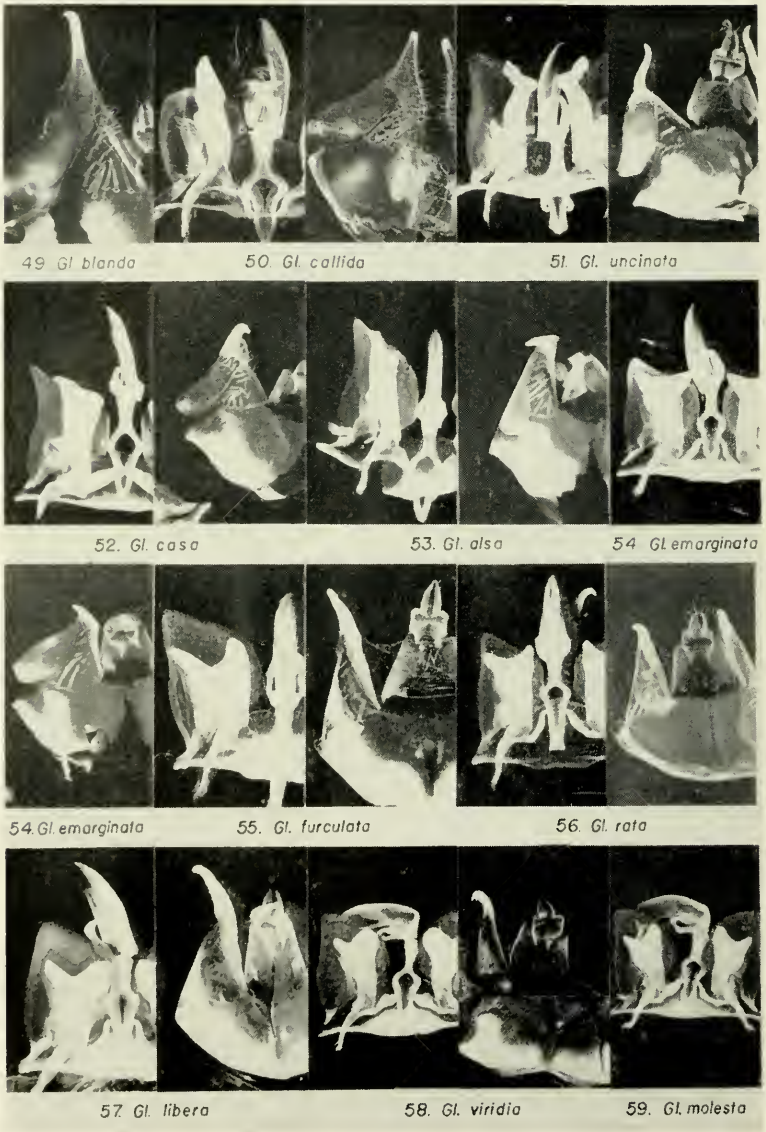
40. Am. attenuata 41. Am. wilburi 42. Am. occidentalis

42. Am. occidentalis 43. Am. acuticauda 44 Am. modesta

44. Am. modesta 45. Am. kansana 46. Gl. curtipennis

47. Gl. dubia 48. Gl. truncata 49. Gl. blanda

PLATE VI



49. Gl. blanda 50. Gl. callida 51. Gl. uncinata

52. Gl. casa 53. Gl. alsa 54. Gl. emarginata

54. Gl. emarginata 55. Gl. furculata 56. Gl. rata

57. Gl. libera 58. Gl. viridia 59. Gl. molesta

PLATE VII

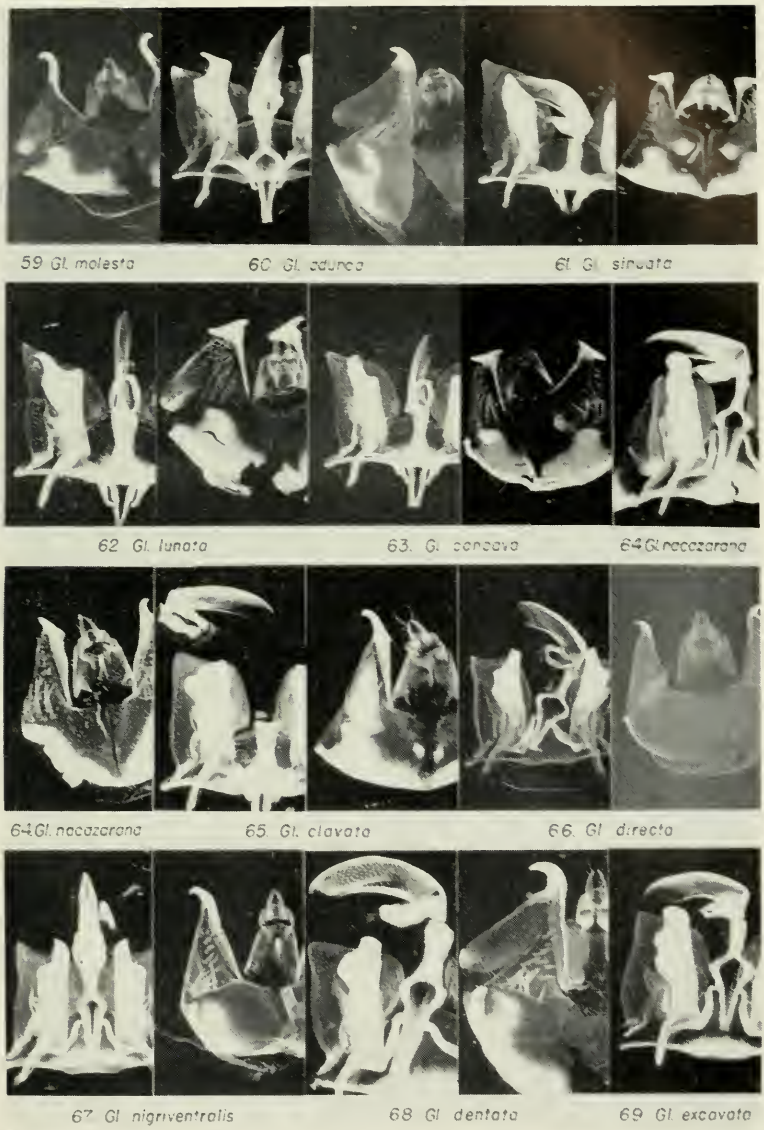
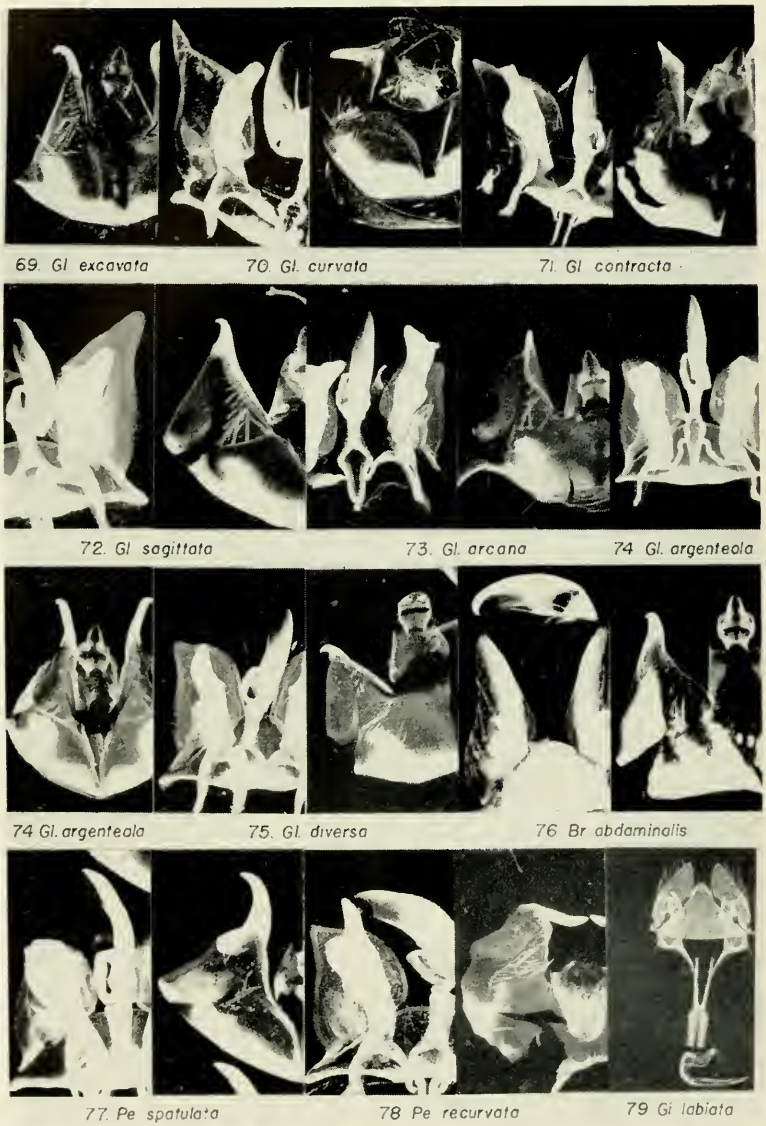

59 Gl. molesta
60 Gl. adunca
61 Gl. sinuata
62 Gl. lunata
63. Gl. concava
64 Gl. nacazarana
64 Gl. nacazarana
65. Gl. clavata
66. Gl. directa
67 Gl. nigriventralis
68 Gl. dentata
69 Gl. excavata

PLATE VIII



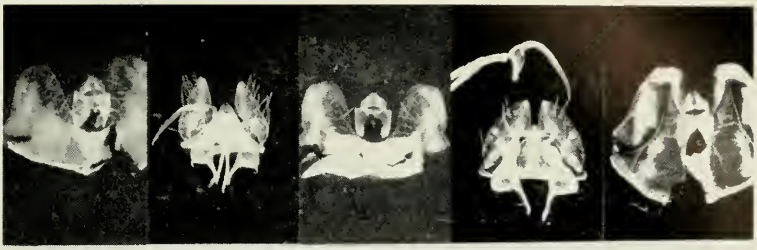
69. Gl excavata 70. Gl. curvata 71. Gl. contracta

72. Gl sagittata 73. Gl. arcana 74 Gl. argenteola

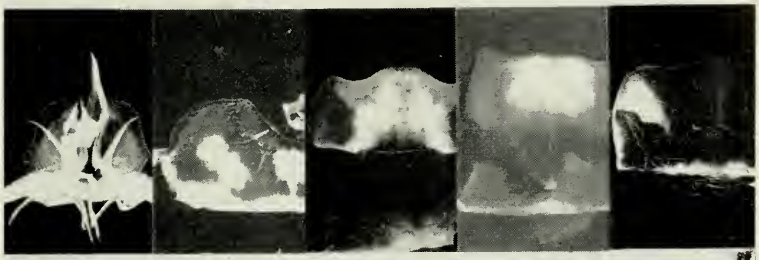
74 Gl. argenteola 75. Gl. diversa 76 Br abdominalis

77. Pe spatulata 78 Pe recurvata 79 Gi labiata

PLATE IX

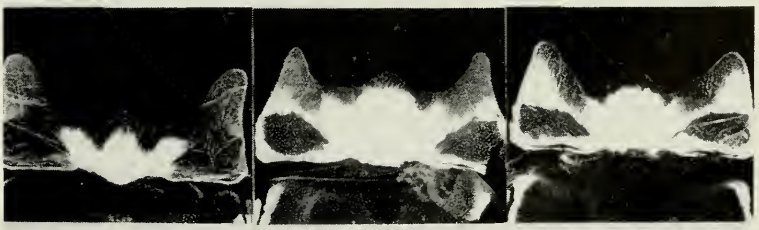


79. Gi. labiata 80. Gi. atropunctata 81. Gi faciata



82. Do. stylata 79. Gi. labiata 80. Gi. atropunctata 82. Do. stylata

1. At gardenia 2. At. magdalena 3. At fredonia



4. At. plana 5. At. incongrua 6. At. terebrans

PLATE X

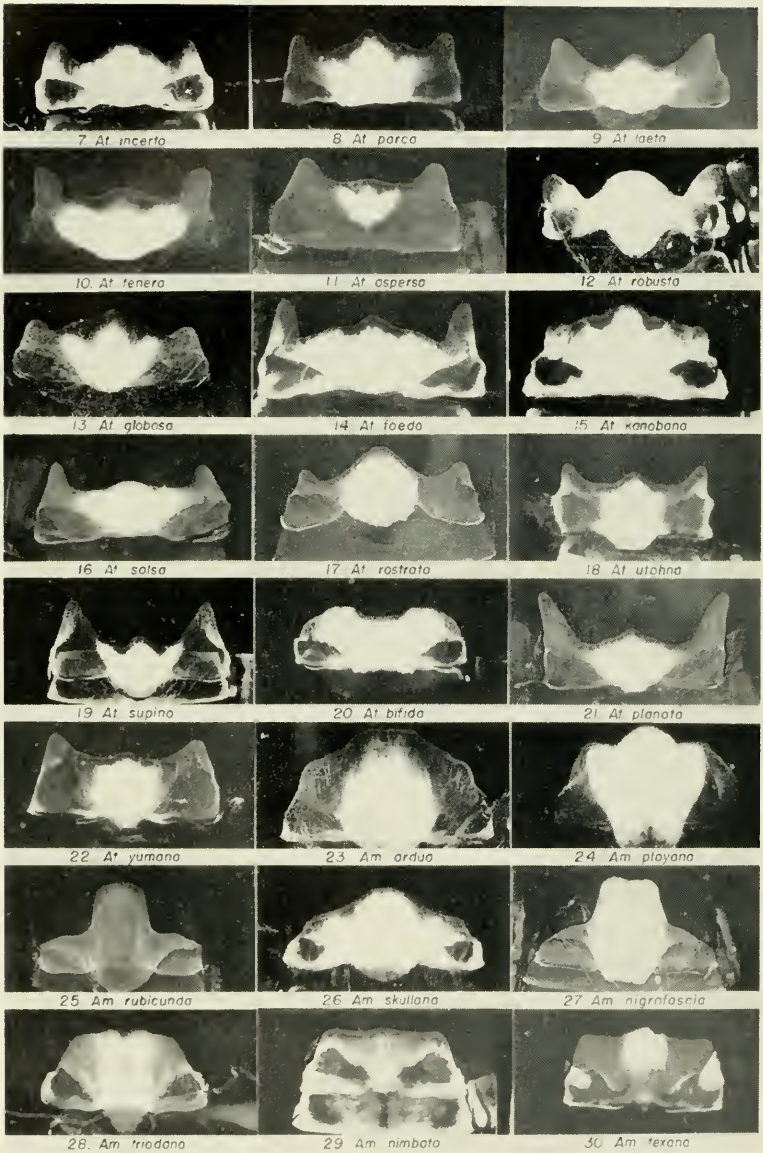

7 At. incerta
8 At. parca
9 At. laeta
10. At. tenera
11 At. aspersa
12 At. robusta
13 At. globosa
14 At. foeda
15 At. kanobana
16 At. salsa
17 At. rostrata
18 At. utahna
19 At. supina
20 At. bifida
21 At. planata
22 At. yumana
23 Am. ordua
24 Am. playana
25 Am. rubicunda
26 Am. skullana
27 Am. nigrofascia
28. Am. triodana
29 Am. nimbata
30 Am. texana

PLATE XI

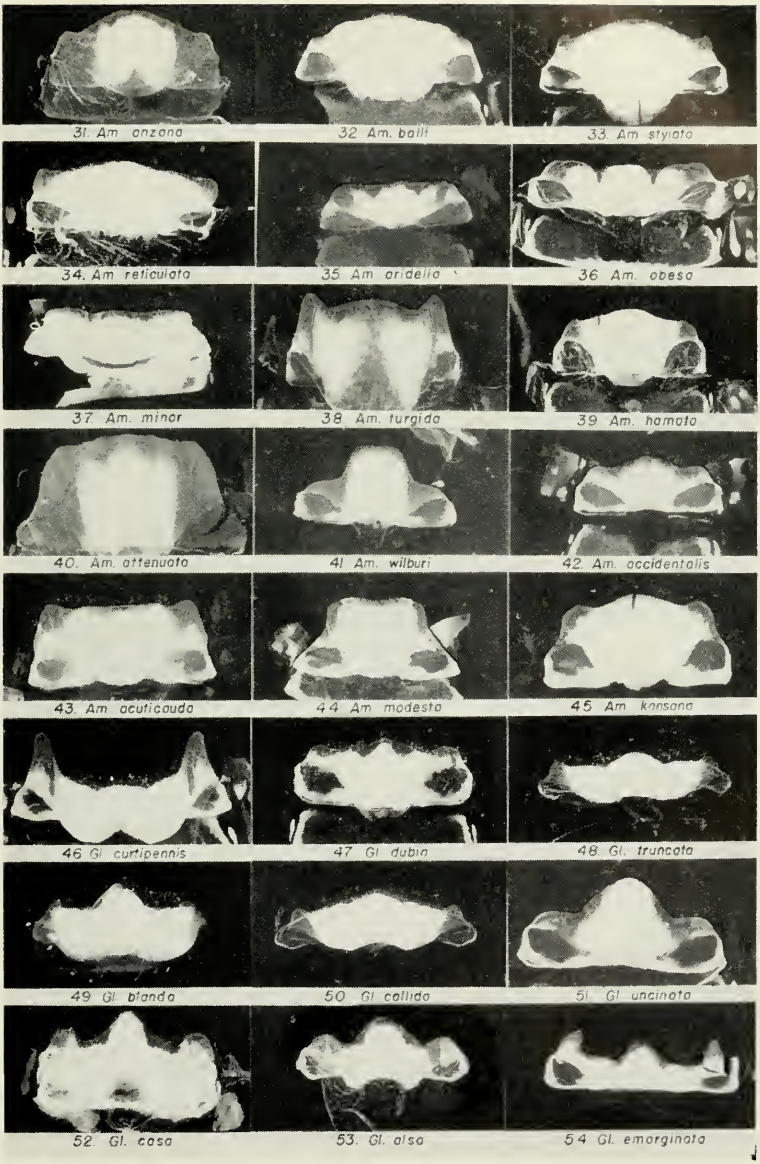
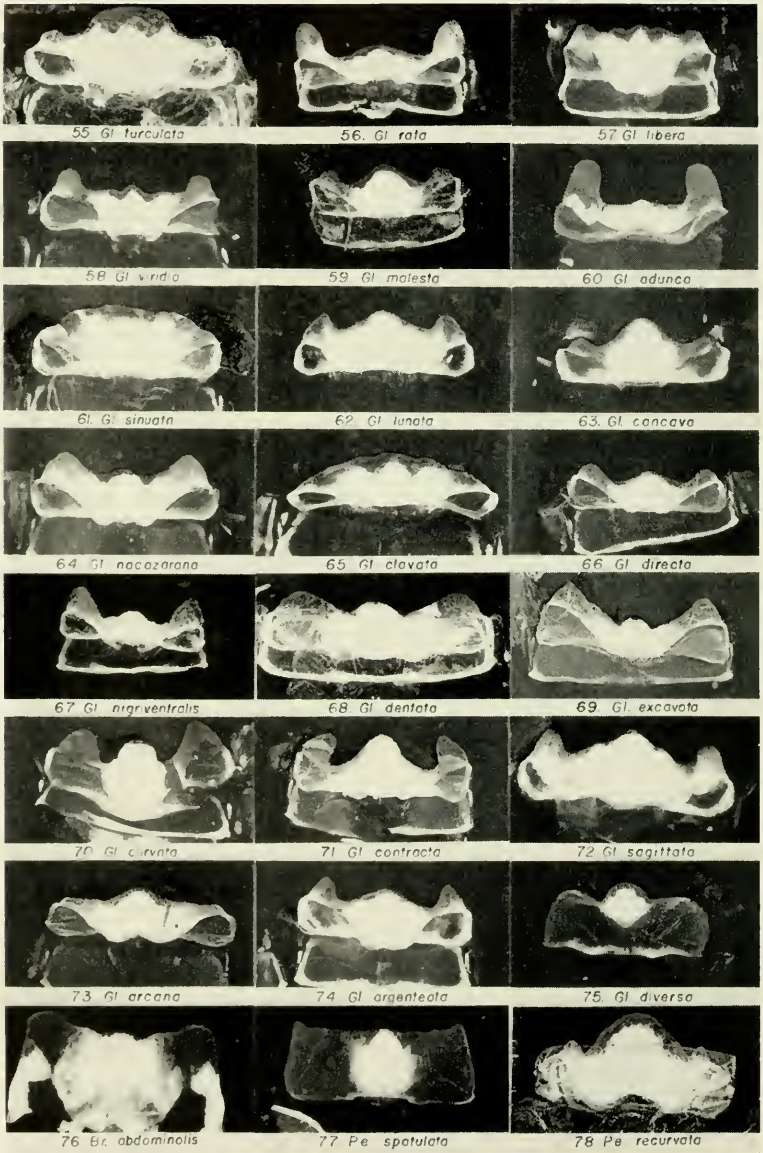

31. Am. onzona
32. Am. balli
33. Am. styiata
34. Am. reticulata
35. Am. oridella
36. Am. obesa
37. Am. minor
38. Am. turgida
39. Am. hamata
40. Am. attenuata
41. Am. wilburi
42. Am. accidentalis
43. Am. acuticauda
44. Am. modesta
45. Am. kansana
46. Gl. curtipennis
47. Gl. dubia
48. Gl. truncata
49. Gl. blanda
50. Gl. callida
51. Gl. uncinata
52. Gl. casa
53. Gl. alsa
54. Gl. emarginata

PLATE XII


55. Gl. furculata
56. Gl. rata
57. Gl. libera
58. Gl. viridis
59. Gl. molesta
60. Gl. adunca
61. Gl. sinuata
62. Gl. lunata
63. Gl. concava
64. Gl. nocazarana
65. Gl. clavata
66. Gl. directa
67. Gl. nigriventralis
68. Gl. dentata
69. Gl. excavata
70. Gl. curvata
71. Gl. contracta
72. Gl. sagittata
73. Gl. arcana
74. Gl. argenteola
75. Gl. diversa
76. Br. abdominalis
77. Pe. spatulata
78. Pe. recurvata

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A Contribution to the Taxonomy of the Subfamily Issinae in America North of Mexico (Fulgoridae, Homoptera)

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Department of Entomology, University of Kansas

PART III

ABSTRACT: This paper comprises the third part of a monograph dealing with the taxonomy of the subfamily Issinae (Fulgoridae, Homoptera) in America North of Mexico. In Part I * the genus *Dictyssa* was discussed. In part II † a key to the genera was given and the following genera were discussed, *Euthiscia, Hysteropterum, Dictyonia, Dictyssonia, Dictyonissus, Neaethus, Misodema, Ulixes, Tylana, Traxus, Thionia,* and *Picumna.* In the present paper seven genera have been revised, namely *Dictyobia, Dictydea, Osbornia, Papagona, Bruchomorpha, Danepteryx* and *Tylanira. Tylanira* Ball is a monotypic genus to date. The genus *Papagona* has two species, as does *Osbornia,* although the latter has one color variety. The genus *Dictyobia* has four species, *Dictydea* seven, *Danepteryx* six, and *Bruchomorpha* twenty, making a total of forty-two species studied in this section of the work. Of this total number the following species are described as new: *Dictyobia varia, Dictydea valida, Dictydea uhleri, Dictydea nigrata, Bruchomorpha keidensia, Bruchomorpha rosea, Bruchomorpha beameri, Bruchomorpha nodosa, Bruchomorpha tenebrosa, Bruchomorpha bunni, Danepteryx adiuncta* and *Danepteryx robusta.* A color variety of *Osbornia arborea* was described and named var. *fusca.*

Some of the older species have been redescribed and comparative notes and drawings are given for all species except the following, which the writer has not seen: *Dictydea falcata* Van Duz., *Dictydea variegata* Van Duz., *Papagona papoosa* Ball, and *Tylanira bifurca* Ball. The male genitalia have been figured for all species except *Dictyobia combinata, Dictydea uhleri, Bruchomorpha nodosa, Bruchomorpha bunni,* and the four listed above.

Synonyms in this paper, all of which are in the genus Bruchomorpha, are as follows: *B. nasuta Stal* = *B. oculata* Newman. *B. flavo-vittata* Stal = *B. dorsata* Fitch. *B. bicolor* Metcalf = *B. vittata* Metcalf and *B. bimaculata* Dozier = *B. jocosa* Stal.

The characters which have been of most value in classification of these species are the male genitalia, the shape and position on the body of the tegmina, the wing venation including the fineness or abundance of reticulation, the shapes and position of both the frons and the postclypeus.

* The University of Kansas Sci. Bull., Vol. XXIV, No. 17, 1936.
† The University of Kansas Sci. Bull., Vol. XXV, No. 20, 1938.
(Mailing date July 10, 1939.)

THE GENUS DICTYOBIA Uhler 1889

Uhler, P. R. New Genera and Species of American Homoptera. Trans. Md. Acad. Sci. 1, p. 39, 1889.

Comparative notes. Tegmina opaque, dark brown to black, with vitreous spots and bands, abbreviated oblong in shape, broadest just at middle, held more or less horizontal to body and about same length as body; reticulation moderate, with cells of apex much larger than rest; venation tending to follow the following pattern: Vein Sc, present, setting off a broader costal margin than in *Dictydea*, vein Sc_2 and R branched near base, vein M branched posterior to apex of clavus, vein Cu divided before middle, each of these veins combining again before apex where they are all connected by an apical vein which circumscribes the corium and thus sets off a distinct apical membrane. Hind wings mere scales. Hind tibiae with two spines.

This genus resembles *Dictyssa*, *Dictydea*, *Dictyssonia* and *Neaethus* more than any others in the subfamily. From *Dictyssa* it is separated by its larger body size and much longer tegmina with an undulating surface. From *Dictydea* it is separated by its much broader wings with rounding costal border while in the latter the costal margin is straight and the tegmina are held vertically against body. It differs from *Neaethus* mainly by having the tegmina subangulately expanded before middle, ramosely reticulate and with the areoles usually large and irregular. In *Dictyobia* the tegmina are horizontal to body, approximately same length as body, but each tegmen undulates between depressions and inflated areas, while in *Neaethus* the tegmina are usually distinctly vertical, longer than the body and flat.

HISTORY OF THE GENUS

Uhler (1889) described the genus with the species *permutata* as the type species. In 1910 Dr. E. D. Ball described *combinata*, and in 1914 Doctor Van Duzee described *atra*. In the present paper one new species is being added, namely, *Dictyobia varia*.

KEY TO SPECIES

1. A robust species, tegmina more than twice longer than width, veins very heavy and correspondingly greatly depressed cells; vertex nearly three times the length of one lateral margin..... *Dictyobia combinata* Ball, p. 86
   Smaller species; tegmina not quite twice longer than wide, veins less elevated, lighter colored with cells less concave; anterior margin of vertex less than two and one-half times the length of a lateral margin..... 2
2. (1) Tegmina less closely reticulated, the pale areoles frequently large, especially near apex, or many united, with their margins studded with spurs of veins. *Dictyobia permutata* Uhler, p. 85
   Tegmina closely reticulated, none of the pale areoles much larger than others, 3

3. (2) Vertex narrower, its anterior margin not much over twice wider than one lateral margin, angulately produced forward beyond eyes; color of dark patches of tegmina variegated brown ..... *Dictyobia varia* n. sp., p. 86

Vertex somewhat broader, its anterior margin about two and one-half times the length of one lateral margin, not produced at all beyond anterior margin of eye, tegmina velvety black with pale areoles in sharp contrast.

Dictyobia atra Van Duzee, p. 85

Dictyobia permutata Uhler, 1889

Uhler, P. R. New Genera and Species of American Homoptera. Trans. Maryland Acad. of Sci. 1, p. 39, 1889.

Comparative notes. Uhler described the species from five females taken at Los Angeles, Cal., and for which he gave the size as being 5-6 mm. The writer had available for study one female specimen from the National Museum, collected by C. V. Riley at Los Angeles and two male specimens from Coquillet's collection taken at Los Angeles, and the length of these was 4.4-4.5 mm. The males showed the distinguishing characteristic mentioned by Van Duzee and Uhler of the pale areoles being fewer in number, larger towards the apex, but the female specimen showed more numerous pale cells with greater uniformity, although at several spots these smaller cells tended to join together to produce the larger hyaline spots. Frons with median carina prominent, the disk yellowish-tan spotted with dark brown.

Male genitalia. The harpago in flattened lateral view is distinguished by having a larger, more curved external hook than in other species as is seen in the drawings. The anal flap is approximately twice longer than wide and the eleventh segment bears a short stylus.

The aedeagal structure is distinctive. The basal fourth of the aedeagus is covered by the semimembranous theca which on the dorsal side extends caudad into a long, slender, sharply tapering flap which does not quite reach the apex of the aedeagus. The aedeagus is a sclerotized tube, bearing at approximate base of apical fourth a small spinelike process and near base, projecting beyond the posterior lateral margin of the theca, two sickle-shaped processes, of which the ventral one is a trifle the shortest.

Notes on distribution. Described by Uhler from specimens taken at Los Angeles, Cal. One additional specimen has been noted from Monrovia, Cal.

Dictyobia atra Van Duzee, 1914

Van Duzee, E. P. A Preliminary List of the Hemiptera of San Diego, Cal. Trans. of San Diego Soc. of Nat. Sci. 2 (1), p. 42.

Comparative notes. In the original description Mr. Van Duzee states that it is the size and form of *permutata,* presenting no really good structural characteristics, but that it may be distinguished by

its velvety black color, especially on the elytra. He gives the length as 4-5 mm., and points out that the elytra are closely reticulated with the pale vittae obscured by black veinlets and with none of the pale areoles materially larger as they are in *permutata*.

The differences noted above are the main distinguishing characters other than the male genitalia. The species of this genus are not easily separated.

Male genitalia. The anal flap seems comparatively shorter and broader than in *permutata*, its length being only one-third longer than its width. The eleventh segment is more conspicuous and bears a relatively longer stylus.

The harpago in flattened lateral view has its dorsal apical angle somewhat more produced and the external lateral hook is proportionally shorter.

The aedeagus differs from that of *permutata* by having the two curved basal hooks proportionally longer, by lacking the small stiletto process at base of apical fourth and instead having a sharply pointed longer process at about middle of aedeagus.

Notes on distribution. Described by Doctor Van Duzee from numerous examples taken on the chaparral from May to July at San Diego, Cal. Examples in the Snow Entomological Collection are from Idyllwild, San Jacinto Mountains, Big Bear Lake, Monrovia and Cajon, Cal.

Dictyobia combinata Ball, 1910

Ball, E. D. New Genera and Species of Issidae (Fulgoridae). Proc. Biol. Soc. Wash., XXIII, p. 43.

Comparative notes. Doctor Ball points out in the original description that it is slightly longer than *permutata* with longer, less angled elytra. The author found the length of the female specimen studied to be 4.8 mm., and that the tegmina were over twice wider than long with the costal margin distinctly rounding. The vertex of this species is broader than in other species, six times wider than its median length.

Male genitalia. Only one female was available for study.

Notes on distribution. Described from five specimens taken at Colfax, Cal. The author had one specimen from San Jacinto Mountains, California.

Dictyobia varia n. sp.

ORIGINAL DESCRIPTION

Size. Greatest length varies between 3.5 mm. and 4.2 mm. Greatest width of tegmen 1.8 mm. This is the smallest species in the genus.

Color. General color lighter than in other species, being yellowish-tan marked with brownish-fuscous. Vertex fuscous except a median pale-yellow stripe and a thin pale border on all sides with, however, the carinalike edges brown. Eyes fuscous. Frons tan variegated with brown through disk, the brown marks becoming deeper just inside lateral margins where they set off circular yellow spots of varying sizes. Postclypeus light yellow, washed on each lateral disk with brown. Pronotum yellow, washed in fuscous, a light yellow median stripe and each lateral disk speckled with dark brown; mesonotum reddish-brown except extreme lateral corners, thin median line and posterior apex light yellow; venter at thorax light yellow. Abdomen light yellow near base, becoming reddish-brown toward apex, sometimes terga of 6th, 7th and 8th segments mottled with dark brown. Tegmina more variegated or speckled in appearance than other species; longitudinal veins, tannish-yellow, veinlets between dark brown in sharp contrast to the white areoles; the pale areoles forming a diagonal vitta from middle of clavus to the costa behind middle, somewhat constricted at middle, where it sends a branch to the inner apical angle so that a rough Y is marked off in the fuscous background, the fuscous areas mottled in fuscous and reddish-brown; on the costal margin is a pale spot consisting of several round pale spots and another row of pale spots near apex just anterior to apical vein, the entire costal and apical margins bordered with white spots which are smaller and more circular at base, becoming fewer and larger toward apex so that the brown spots between are greater in diameter than the white ones. Legs mostly light brown, except pale at tips of coxae, femora and tarsi and a longitudinal stripe down length of femur, claws black-tipped.

Structural characteristics. Vertex narrower in this species, being only twice wider along anterior margin than one lateral margin and the anterior margin roundingly produced. Frons narrowed, with parallel sides and one lateral margin slightly more than one-fifth longer than the basal margin. Pronotum concave through disk, a crescent-shaped carina elevated against vertex, behind eyes narrowed to a slender arm, becoming knoblike at extreme side, after which it expands into a platelike flap below eye on ventral side. Mesonotum with two diverging distinct lateral carinae. Tegmina not extending beyond abdomen, with position on body and undulations characteristic of genus, longitudinal veins distinctly elevated, cross nervures less so, reticulation finer even than in *D. atra*, especially near base, cells less concave than in *combinata* or *atra*.

Male genitalia. Anal flap parallel-sided, truncate at apex, not quite twice longer than wide. Eleventh segment distinctly visible with a prominent fingerlike stylus.

Each harpago from flattened lateral view is distinctive from other species in that the apical dorsal angle is much less extended dorsad into a shorter apical hook and externally bears a longer, recurved hooklike process.

The aedeagal structure also differs distinctly by having the two curved basal hooks which protrude beyond posterior margin of the theca, much broader basally and thus proportionally much thicker and shorter than in other species while the aedeagus itself is proportionally much shorter.

Comparative notes. This species is distinguished from other species externally by its more mottled coloring of the tegmina with the distinctive light longitudinal veins, its finer reticulation, less concave cells and its narrow vertex. The male genitalia differ as mentioned above.

Distribution and types. Described from one male holotype, one female allotype and 8 female and 7 male paratypes taken at Big Bear Lake, California, on July 26, 1932, by Dr. R. H. Beamer. These types are in the Snow Entomological Museum at the University of Kansas.

The Genus Dictydea, 1888

HISTORY OF THE GENUS

This genus was erected by P. R. Uhler in 1888 for two species, *angustata* Uhler and *intermedia* Uhler. Both are taken in California. In 1938 Dr. E. P. Van Duzee described two additional species, *variegata* and *falcata*. In the present paper three new species are being added, namely *D. valida*, *D. uhleri* and *D. nigrata*.

Comparative notes. This genus seems to be a transition between the genera *Danecteryx* and *Dictyobia*. Its distinguishing characteristics are a quadrangular vertex, depressed through disk, a hemispherical pronotum protruding forward between eyes with elevated anterior margins, becoming very abbreviated as a thin arm around eye, which again broadens into a flat, broad plate on side of head below and posterior to eye. Frons vertical to body, clypeus deflexed. Tegmina narrow, not usually so scimitar-shaped as in *Danecteryx*, although *falcata* and *variegata* approach this shape, much of the underside of body exposed below tegmina. Venation as follows: Vein Sc_1 close to costal margin, extending approximately halfway of tegmen; main longitudinal veins distinct, elevated, vein Sc_2 and R

branching somewhere around middle, M vein branching in the neighborhood of claval apex, sometimes four-branched. Hind wings short and folded once longitudinally. Hind tibiae with two spines.

KEY TO SPECIES

1. Tegmina broad, two and one-half to three times longer than greatest width; vertex broad, anterior margin more than twice length of lateral margin.. 2
   Tegmina narrower, three and one-half to four times longer than greatest width; vertex narrower 5
2. (1) Tegmina greatly widened across apex, considerably sloping; color yellow with fuscous and hyaline spots and bands..... *D. valida* n. sp., p. 89
   Tegmina only moderately expanded across apex so that costal and anal margins are subparallel; color dark with whitish spots in sharp contrast..... 3
3. (2) Tegmina uniform dark brown with hyaline spots only in the cellules along the border ..... *D. angustata* Uhler, p. 91
   Tegmina dark brown, but with additional hyaline spots on corium or clavus, or both 4
4. (3) Body and tegmina almost black, uniform except for a few hyaline spots halfway of clavus, another small group along costal border at base of apical third; clavus long ..... *D. nigrata* n. sp., p. 92
   Tegmina dark with many hyaline spots and a distinct transverse hyaline band across corium just posterior to apex of clavus.... *D. intermediate* Uhler, p. 94
5. (1) Tegmina not so narrow, only about three and one-half times longer than greatest width; blackish-brown with white border marks, *D. uhleri* n. sp., p. 95
   Tegmina narrower, about four times or more longer than greatest width.... 6
6. (5) Tegmen long, strongly decurved at apex, black with a sutural white spot beyond tip of the clavus, the margin sparsely spotted with white. Length, 6 mm. *D. falcata* Van Duzee.
   Tegmina parallel, with the apex lanceolate and the costa straight, the sutural margin white with fuscous veins; body varied with fuscous and pale. Length, 4-5 mm. ..... *D. variegata* Van Duzee.

NOTE.—The writer did not have specimens of *D. falcata* or *D. variegata* for study. The characters given in the above key are taken directly from the key in Professor Van Duzee's paper (1938). The specimens of *D. nigrata* were compared by Doctor Beamer with the specimens in Professor Van Duzee's collection and found not to be the same.

Dictydea valida n. sp.

Size. One of the largest and most robust species in the genus. Length of female from apex of head to tip of tegmen, 5.2 mm. to 5.4 mm.; length of male, 4.8 mm. Greatest width of tegmen just back of claval apex, 1.7 mm.

Color. Color distinctive, having a general tan color marked with fuscous, whereas other species are piceous black. Upper body tan, marked with splashes of reddish-brown on disk of vertex, pronotum and mesonotum; a faint cream median line on vertex and pronotum, on each side of which, on pronotum, are two round, depressed spots. The thin carinate margins of frons, vertex, pronotum, dark brown. The carinae, lateral margins and apex of mesonotum lighter yellow tan. Frons golden tan with an irregular dark spot in center and numerous round, brown, depressed spots along each lateral margin. Clypeus golden tan with brown oblique bands on each lateral disk of postclypeus and each lateral half of anteclypeus mostly dark.

Eyes reddish-brown. Thoracic segments yellowish-brown. Legs golden brown with darker streaks on femora, carinae of tibiae and tarsal claws blackish-brown. Abdominal segments mostly yellow tan, the first few segments marked with round, brown spots across disks of venter and sometimes the lateral posterior margins dark brown. Tegmina splotched in cream, light and dark fuscous as follows: A large, irregular dark fuscous spot with base starting at apex of clavus and spreading over into corium; a smaller, dark spot in line with this on costal border from whence a lighter fuscous longitudinal band extends cephalad to base of tegmen; an indefinite brownish crescent across apex inside of membrane; these darker areas thus setting off an irregular light Y of creamy, semiopaque cells on each tegmen as viewed from the side; veins light yellowish-tan.

Structural details. Vertex deeply depressed across disk with lateral and anterior margins sharply carinate and elevated, its width along anterior margins three times greater than on lateral margins. Pronotum with anterior margin evenly, roundingly protruded between eyes, each lateral part of this margin distinctly elevated, although not as much as in other species, disk depressed with a pair of round, sunken pits in middle. Mesonotum elevated up from sides, having a long anterior border through middle a deep crescent-shaped crease, on each side a lateral carina which extends from anterior border to posterior border, a less pronounced median carina present and the extreme apex set off by a shallow, depressed transverse line. Frons slightly longer than wide, the lateral margins outwardly rounded and somewhat elevated, and a well-pronounced median carina present. Clypeus in length equal to anterior margin, angulately produced into frons. Tegmina distinctive in shape because of its more evenly rounded claval and apical margin, giving the wing a hemispherical shape and a much greater slope to the costal margin. Venation prominent, vein M branching considerably anterior to middle and Sc_2 and R branching posterior to M.

Male genitalia. Anal flap rectangular in shape with posterior ventral margin of the tube truncately notched.

Each harpago from flattened lateral view rectangular with the ventral margin moderately curved outward and the dorsoventral angle extended cephalad into a tapering hook with an external ventrad curving process attached near this point.

The aedeagal structure is long and slender. The sleevelike theca does not quite cover half of the aedeagus on the lateral and ventral sides, is notched or split on the dorsal side, and then this dorsal part

extends caudad as a partially sclerotized flap which is slightly longer than the aedeagus itself.

The aedeagus is a sclerotized tube, bearing two sharply pointed hooks near the base, whose apices show beyond the caudal rim of the theca and a third, smaller, sharply pointed hook at about base of apical third.

Comparative notes. This species is readily distinguished from other species by the large, robust size, the light colored, variegated tegmina, and the semispherical shape of the latter.

Notes on distribution. Described from male holotype and female allotype taken in the Giant Forest, California, July 28, 1929, by R. H. Beamer, two female paratypes same data, one female paratype and one male paratype from Maria county, California, August 3, 1929, by Paul Oman. These types are in the Snow Entomological Museum, University of Kansas.

Dictydea angustata Uhler, 1889

Uhler, P. R. New Genera and Species of American Homoptera. Transactions Maryland Academy of Sciences, Vol. 1, p. 37, 1889.

Van Duzee, E. P. The Genus Dictydea Uhler (Homoptera, Issidae). Pan-Pacific Entomologist, Vol. XIV, No. 1, pp. 33-35.

Comparative notes. This is a piceous black species with no hyaline spots on the tegmina except along the border, and measuring about 5 mm. in length from tip of head to apex of tegmen for female, and 4.5 mm. for male.

Uhler separates this species from *intermedia* by being less robust and with the wing covers not convex behind middle as in that species. Additional minor differences from other species noted by the writer are: The lateral margins of frons subparallel, venation of the tegmen tending to be that vein Sc and R branch at apex of apical third, and vein M at tip of clavus.

Male genitalia. Anal tube and flap larger than in *intermedia*, each lateral margin convex and both converging to a truncate apex where the extreme caudal margin of flap is slightly concave. The eleventh segment is visible as a short, but distinct annulus, and bears an extremely large stylus which is broad at base, then is bluntly pointed and almost reaches caudal margin of flap.

Each harpago in flattened lateral view is subrectangular in shape except for posterior dorsal angle which extends cephalad into a short, recurved hook and at base bears a blunt median hook on the inside and externally a much more sharply pointed hook which curves ventrad.

The aedeagal structure is similar to this process in *intermedia*. For a written description, see the discussion under the comparative notes for that species. A comparison of the drawings will show the differences in the two species. In the drawing of *angustata* the aedeagus has been raised slightly out of its normal position, so that the hooks point somewhat differently.

Notes on distribution. Uhler described the species from a pair taken at Los Angeles, Cal., by Coquillett. Additional specimens in the National Museum and Snow Entomological Collection have been taken at Saugus, Cajon and Mint Canyon, California.

Professor E. P. Van Duzee (1938) states that he has taken *angustata* in Mint Canyon, north of Saugus, California, and Dr. E. C. Van Dyke has taken at Lythe Creek, San Bernardino, California, a series of a form that does not seem to differ except in its larger size and darker color.

Dictydea nigrata n. sp.

ORIGINAL DESCRIPTION

Size. Length of body from apex of head to tip of abdomen for female, 4.8 mm.; male, 4.6 mm. Length of tegmen, 4.4 mm. Greatest width of tegmen, 1.73 mm. Width of pronotum, female, 1.75 mm.; male, 1.6 mm.

Color. Blackest species in the genus. Vertex, pronotum and mesonotum brown-black except for a faint, median, light streak, the extreme lateroposterior angles of vertex and apex of mesonotum yellow. Eyes gray-brown. Frons dark brown, faintly mottled in light fuscous, clypeus yellow-brown, darker on extreme sides. Gena brown-black except the extreme lateral region back of eye and a spot below antennae. Antenna brown-black, except tip of pedicel and connecting conjunctivae of segments. Body segments brown-black mottled in lighter brown, connecting conjunctivae of legs white in sharp contrast to rest of dark body. Legs darkly infuscated except at the bases and apices of segments. Tegmina uniformly pitch brown except for sharply contrasting, semiopaque, white spots in the following places: On clavus a series of roundish spots along inner margin, a group of 3 to 4 spots across its middle, and another single spot toward apex, on corium round, rather uniform, spots scattered all around margin, one or two roundish spots located just anterior to base of apical third along costal margin, another one or two transversely in line with this, but lying between vein M_{3+4} and Cu_1.

Structural characteristics. Vertex somewhat narrower than in *angustata*, its anterior margin being about two and one-half times as

wide as one lateral margin. Frons approximately as in *angustata*, although a trifle narrower as compared side by side, with its median carina sharp and appearing even more elevated than the lateral margins. Pronotum much as in *angustata*, being four times wider than length at middle and the lateral arm behind eye elevated knoblike, after which it narrows again to surround eye before expanding into the characteristic flattened lobe on the extreme side of head. Tegmina of the broader type, its length about two and three-fourths times its greatest width, which is at base of apical third. Longitudinal veins distinct, but not as much as in some species, cross veins also distinct. Vein Sc_2 and R branching just before middle, vein M in line with apex of clavus, Cu_1 branching anterior to middle.

Male genitalia. Tenth abdominal segment extremely long, almost parallel-sided for two-thirds its length, then narrowing considerably to form the anal flap of which the apical margin is concave. Eleventh segment ringlike, visible beyond the dorsal posterior rim of the tenth segment, on its ventral margin bearing a broad stylus.

Each harpago from a flattened, lateral view is rather L-shaped, the dorsal posterior third extended into a triangular projection, at base of which on inside is a broad, pointed hook, another external to this with a slightly recurved apex.

The aedeagus is a long, slender, gooseneck tube covered on basal third by the more sclerotized, sleevelike theca. The dorsal part of the latter is extended caudad as a pointed flap which does not quite reach to apex of aedeagus. No sclerotized hooks of the aedeagus are visible, but one is visible through the wall of the theca.

Comparative notes. This is one of the broader-winged species in the group, each tegmen at its greatest width being about two and three-fourths times longer than wide, while in *angustata* it is about two and one-half times longer than wide. In color it resembles *D. falcata* Van Duzee, but is separated from that species by the much broader tegmina.

Notes on distribution and types. Described from two specimens, holotype male and allotype female, taken at San Antonio Canyons, California, on August 4, 1938, by R. H. Beamer. Types are in the Snow Entomological Museum at the University of Kansas.

Dictydea intermedia Uhler, 1889

Uhler, P. R. New Genera and Species of American Homoptera. Transactions Maryland Academy of Sciences, Vol. I, p. 38, 1889.

Van Duzee, E. P. The Genus Dictydea Uhler (Homoptera, Issidae). Pan-Pacific Entomologist, Vol. XIV, No. 1, pp. 33-35.

Comparative notes. This species was described from three females, of which the length was given as 5-6 mm., and the width across pronotum as 1.75 mm. The length of the males is around 4 to 4.6 mm., and the width of pronotum 1.6 mm.

The main distinguishing features of this species are that the lateral margins of frons are slightly convergent; the costal margin of tegmen is slightly convex behind tip of clavus; the vein Sc_2 and R usually branches at middle and M at middle or slightly posterior and the color pattern of tegmen is as follows: Ground color black piceous, with a large hyaline triangular spot spreading across the clavus upon the adjoining cells of corium, a band of the same color transversely crosses the corium behind tip of clavus, a similarly colored spot curves near the apex and the flattened border all around the wing cover is interruptedly brown and hyaline.

Male genitalia. Anal flap elongate, the ventral margin expanded only one-third of the total length, at apex only slightly concave. The eleventh segment is not visible except for fingerlike stylus.

Each harpago in flattened lateral view narrowed at base, greatly expanded across apex, its apical dorsal region extended into a slender, slightly cephalad curving hook, bearing just back of middle along dorsal margin two short hooks, a much shorter stout inner one and a slightly longer external one which curves downward and slightly cephalad.

The aedeagal structure is asymmetrical. From the left side the theca covers the basal third of the aedeagus like a membranous sleeve, then splits along the side, the ventral part then forming a bluntly pointed flap reaching only halfway of the total structure, the dorsal part extended caudad into a long, sharply pointed flap which is as long as the aedeagus itself. The exposed part of aedeagus between the split theca is tubular, ending in a sharply pointed spine and bearing in all four sclerotized processes, two located on the left side at the place where the theca is notched, and a small one near tip. On the right side is a larger, recurved process attached approximately at middle and extending to base of apical third of aedeagus.

Notes on distribution. Uhler gives the type locality as Los Angeles, California. The writer had a few specimens for study from

the following places in California: Saugus, Mint Canyon, Big Bear Lake and Cajon.

Professor E. P. Van Duzee (1938) states that this species is a common species in Mint Canyon on the holly-leaved cherry, *Prunus illicifolia*.

Dictydea uhleri n. sp.

ORIGINAL DESCRIPTION

Size. Male, from apex of head to tip of tegmen, 4.7 mm. Greatest width of tegmen, 1.2 mm. Width across pronotum, 1.4 mm.

Color. Ground color fuscous brown. Vertex with a faint median streak and each lateroposterior corner yellow. Eyes gray-brown, head back of them yellow. Frons yellow, washed in longitudinal streaks of brown, a broad uninterrupted one on each side of median carina, and another mesad of each lateral carina which is interrupted lengthwise through middle by yellow spots. Postclypeus yellow with oblique brown stripes at side, anteclypeus yellow through middle, darker at sides. Gena yellow, a spot before antenna, and another before the eyes brown. Pronotum uniform brown except for a narrow median line of yellow and the yellow elevated margins which again are dark brown on extreme edge. Disk of mesonotum brown, crossed by a median longitudinal yellow line, rest yellow. Underside of body cream yellow, becoming slightly darker on disks of the thoracic sclerites and at sides of the abdominal terga and tip of male harpagones; a few round, dark spots at sides of first few abdominal sterna. Coxae yellow, infuscated with brown, rest of segments dark brown with carina or longitudinal streaks yellow. Tegmina uniform fuscous brown except for the entire border, which is yellowish-white crossed by numerous dark veinlets or broader dark bands, a small white spot on corium just inside of apex of clavus, a larger triangular area of several semiopaque white cells on corium just posterior to apex of clavus.

Structural details. This is a small, narrow-winged species. Vertex narrower than in several species, its anterior margin only twice wider than one lateral margin or four times its length through middle. Frons narrow, lateral margin one-third longer than its basal or posterior margin, its length through middle equal to length of clypeus, median carina sharp and complete for length of frons, the two lateral margins more or less parallel and greatly elevated. Pronotum roundingly produced between the eyes, not quite to the anterior margin of eye, the margins moderately elevated, behind eye reduced to a characteristically narrow rim. Mesonotum depressed considerably through middle, so that lateral areas and apical third are elevated

somewhat knoblike. Tegmina narrow, being about three and one-half times longer than greatest width, which is at base of apical third, not much slope to the costal margin of tegmen in situ since the latter and clavaI margins are subparallel. Longitudinal veins, thick and conspicuous, branching as follows: Vein Sc and R branching posterior to middle and vein M considerably anterior to middle.

Comparative notes. This species is easily distinguished structurally from other species by the width of the tegmina, being not as narrow as *falcata* and *variegata* nor as wide as the remaining species. It has a narrower vertex proportionally than the majority, has the pronotum much more reduced behind eyes, and a more elongate frons. In color the species is differentiated by the color pattern of the tegmina as can be noted by reading the descriptions of these structures for the various species or by looking at the drawings.

Notes on distribution. This species was described from one male specimen in the National Museum collection, designated P. R. Uhler collection on a printed label, above which is an ink label, bearing an illegible abbreviation Los Ang., which the writer has interpreted to be Los Angeles. No date is given for the specimen. Holotype specimen in the National Museum Collection.

THE GENUS OSBORNIA Ball, 1910

Ball, E. D. New Genera and Species of Issidae. Proc. Biol. Soc. of Washington XXIII, pp. 41-46.

Comparative notes. The distinctive features of this genus are the ovate, abbreviated tegmina, the elevated and triangularly extended, anterior margin and deeply concave disk of the vertex, the strongly inflated clypeus, tricarinate mesonotum, very rudimentary wings and posterior tibiae with one or two spines.

Wing venation. The venation in this genus is reduced. Vein Sc_1 is not distinct. Veins Sc_2, R, M, and Cu_1 are all single veins arising from the usual basal cell. Vein Cu_2 is found in the clavaI suture. First and second A united at tip to form the usual y. The rest of the tegmen is traversed by an irregular network of fainter veins.

KEY TO SPECIES

1. Lateral carinae of vertex and frons meeting above eyes in an acute earlike horn, with anterior margin of vertex emarginate; much abbreviated truncate tegmina, exposing half the abdomen or more. . . . . *Osbornia cornuta* Ball, p. 97
   Vertex angularly produced cephalad, lateral angles above eyes not unusually produced; tegmina somewhat abbreviated, but not exposing more than two or three abdominal segments 2
2. (1) Body and tegmina yellow to green with fuscous markings usually only around apical margin of tegmen, sometimes a median brown band on pronotum and clavaI margin fuscous. . . . . *Osbornia arborea* var. *arborea* Ball, p. 98
   Body and tegmina mostly fuscous or yellow with strong fuscous markings on tegmina . . . . . *Osbornia arborea* var. *fusca* Doering, p. 99

Osbornia cornuta Ball, 1910

Ball, E. D. New Genera and Species of Issidae. Proc. Biol. Soc. of Washington XXIII, pp. 41-46.

Comparative notes. The distinctive features of this species are the acute outer angles of the vertex which are extended earlike above the eyes; the much abbreviated tegmina which are not much longer than broad, and roundingly truncate at apex, expose at least half the abdominal segments and are usually slightly separated by the elevated abdomen; the somewhat compressed abdomen, most segments of which have distinct tuberculate median elevations.

The general body color of *cornuta* is dark brown, speckled and banded with light or reddish-yellow and for the tegmina light with veins and splotches darker.

This species when captured has very frequently already lost its wings or very soon does so after being taken in the net. For this reason many specimens in collections are wingless.

Male genitalia. Anal flap (10th abdominal segment) broad, parallel-margined for two-thirds its length, then tapering to a truncate apex. Eleventh segment typically reduced, bearing a long, slender genital stylus.

Harpagones (genital styli of authors) visible externally as two, long, tapering plates, whose inner margins are adjoined, and very little of abdomen showing beyond their apices. Each harpago as viewed from a flattened lateral view is rectangular and has its extreme dorsocaudal angle prolonged cephalad into a sharply pointed, recurved hook at the base of which is a flat, triangular, external hook. (See drawing 3a, plate XV.)

The aedeagus is asymmetrical. From the left side it appears as a long, slender, roundingly curved tube, partially membranous, bearing at apical seventh a long caudad-projecting spine and near its base a pointed, heavily sclerotized hook, which shows only halfway beyond the thecal margin. On the right side the aedeagus shows an external, slender, pointed hook attached just slightly caudad of middle. The theca is membranous and therefore difficult to trace. It covers the basal fourth of the aedeagus as a tube, then on the left side has its caudal margin somewhat broadly notched through upper middle to allow the aedeagal hook to show, its margin ventrad of the notch prolonged caudad into a slenderly tapering, curved process and dorsad of notch as a short, blunt process. On the right side the ventrocaudal angle of the theca projects caudad as slightly

curved, pointed process, whose apex reaches to a point midway of the length of the aedeagus.

Notes on distribution. Doctor Ball described the species from 12 examples taken at St. George, Utah and Mojave, California. A large series is found in the Snow Entomological Collection, University of Kansas, collected by Dr. R. H. Beamer, from Mojave and Palmdale, California, in July, and two specimens from El Paso county, Texas, in July.

Osbornia arborea Ball, 1935

Ball, E. D. Some New Issidae with Notes on Others. Bull. Brook. Ent. Soc. XXX, p. 38.

Comparative notes. Resembling *cornuta* Ball in size and general body form. It differs from *cornuta* by not having the prolonged angles of vertex above the eyes, by its anterior margin of vertex triangularly produced cephalad, and by having much longer tegmina which in this species cover all but the last two or three apical segments of the abdomen, but in *cornuta* only the first two or three basal ones.

Other easily recognized characteristics are the uniform yellow and green color and the transverse depression through middle of tegmina.

Male genitalia. Anal flap (10th abdominal segment) a broad parallel-margined flap which tapers to a slightly emarginate, truncate apex. Eleventh segment not easily visible externally, bearing a short genital stylus.

Harpagones (genital styli of authors) visible externally as two pointed, slender plates, whose length is about three and one-half times their width. Each harpago as viewed from a flattened lateral view appears pear-shaped, but with its dorsocaudal angle prolonged dorsad as a broad, flat extension which is roundingly emarginate at its apex. At the base of this extension is a triangular, flat, external hook whose apex is directed ventrad.

The aedeagus in this species is a curved semisclerotized tube with more of a bend in it than in *cornuta*. It is asymmetrical. On the left side it bears a short, thick, spinelike process near its apex and two others attached near base, the dorsal one of which is the longer, broader as it emerges from the theca and at the end forming a slender curved hook, both hooks covered at base by the theca. On the right side it is spineless. The theca is a semimembranous tube embracing about one-half of the aedeagus at base and which on the right side is truncate at its posterior end. On the left side the theca splits along the ventral side, allowing the aedeagus to emerge between the folds.

Notes on distribution. Doctor Ball described the species from about fifteen specimens taken at Patagonia, Arizona, on juniper. In the Snow Entomological Collection at the University of Kansas is a large series taken by R. H. Beamer in July and August at Red Lake, Santa Rita Mountains, Coconimo county and Oak Creek Canyon in Arizona, and several specimens from Tucumcari, New Mexico. Mr. E. W. Davis took two specimens from St. George, Utah in August.

Osbornia arborea var. *fusca*

In its extreme color phase this variety is entirely fuscous bordered with black. Vertex smoky brown, except a median line and lateral margins creamy yellow to green. Eyes gray, washed in brown. Frons uniform fuscous except each laterobasal corner and a longer spot on each apical-lateral corner which is light yellow to green and a vertical row of small, dark, brown dots, usually in pairs extending the full length of the disk on each side of the lateral carinae. Clypeus light brown except dark, oblique lines across disk, a spot at the basolateral angle and the extreme lateral margin light. Labrum fuscous. Genae around eyes fuscous, below antennae greenish-yellow. Antennae fuscous. Pronotum from above dark fuscous except for a light spot back of eye in which are found a number of very round, uniform-sized brown dots, pleural flaps of pronotum greenish-yellow through middle, anterior and ventral margins brownish. Mesonotum dark brown, with a faint, light band indicated on each side and the extreme apex light. Tegmina shining brown to almost black, except for somewhat fainter indistinct spots at wing base, a transverse band just anterior to middle, and a roundish spot across apical dorsal cells. Dorsum of abdomen dark brown except for median lighter band, a broader one under the tegmina. Venters of thorax and abdomen blackish-brown, the pleural sclerites light green in sharp contrast. External genitalia of male brown with margins lighter. Female lighter than male. Tegmen yellow with clavus bordered in black, black splotches across middle of corium and apical margins black, a broad band of light across abdominal venters and most of ovipositor valves yellow, edged in black.

Some specimens of true *arborea* approach in color the females of *fusca* by having faint touches of dark on pronotum and border of corium. These, however, usually lack a spot across middle of corium and the black is not so pronounced.

Location of types. Holotype male, collected at Las Vegas, N. Mex., July 18, 1936, allotype female, same place and date, by R. H.

Beamer. Two paratype males, same date. Two paratype males, although lighter in color, from Tucumcari, N. Mex., collected by R. H. Beamer, June 23, 1929. Doctor Beamer states that these specimens were taken from juniper. These types are in the Snow Entomological Collection at the University of Kansas.

THE GENUS BRUCHOMORPHA

Newman, Edward. Ent. Mag. V, p. 399, 1838.

Stal, Carolus. Novae vel minus cognitae Homopterum formae et species. Berl. Ent. Zeit. VI, p. 310, 1862.

Metcalf, Z. P. The Fulgoridae of Eastern North America. Jour. Elisha Mitchell Soc. 38; 139-230. 1923.

Dozier, Herbert. The Fulgoridae or Plant Hoppers of Mississippi. Miss. Agric. Exp. Sta. Bull. 14, pp. 3 to 149. 1926.

Ball, E. D. The Genus Bruchomorpha Newman (Homoptera-Fulgoridae) Bull. Brook. Ent. Soc. XXX, Nos., pp. 197-203. 1935.

Comparative notes. Head broad, the vertex approximately six times wider than its greatest length, the frons extended forward, sloping, from above triangular, bearing a less pronounced median carina, usually two well-pronounced lateral carinae which form an ovate or top-shaped central tablet between, the extreme lateral margins of frons elevated carina-like forming a sharp shelf over the genae. Postclypeus elongated, extended forward and parallel to body, together with the extended frons making up the so-called frontal process. Pronotum with anterior margin roundingly produced between eyes, posterior margin only shallowly emarginate, at sides behind eyes so greatly reduced as to be practically hidden by eyes, then again expanding platelike at sides, around eyes and posterior to gena so that each gena is a deep pocket in which are located the antennae. Mesonotum is broad, triangular, with a median carina and two lateral, slightly converging carinae usually indicated. Tegmina usually brachyterous, occasionally macropterous forms in some species, snugly fitting but not covering abdomen, parallel at sides, cut off straight behind with the terminal corners rounded, parchmentlike, thickly reticulate venation. Hind wings of macropterous forms present and large although shorter than tegmina; entirely lacking in brachypterous forms. Abdomen globose, narrowed behind into a blunt tip. Legs short, hind tibiae with one spine.

Macropterous forms

Long-winged individuals have been found in collections for five species in this genus. In these five they are very rare. In a series of several hundred specimens of *B. oculata* two specimens only were found, in a large series of *B. keidensia* only one, and only one

each in *B. nodosa* and *B. pallidipes*. The writer did not have any specimens of *B. vittata* for study.

In all cases the nasal process and general coloring of body were identical in both brachyterous and macropterous forms, so that the species can be identified in the usual ways. In addition there seems to be specific differences in the color of the wings and slightly in the venation. *B. oculata* and *B. keidensia* both have fuscous front and hind wings, with very heavy dark-brown veins. The former tends to have a tendency of the veins of front wing, branching more than in *keidensia* although since the two wings of the same individual were different this cannot be relied upon as a distinguishing characteristic.

B. pallidipes had pale-colored wings, with less heavy, light-yellow veins. *B. nodosa* had fuscous or dark brown front wings and milky white hind wings with brown veins. This specimen was broken too badly to draw.

The venation of *B. oculata, B. keidensia,* and *B. pallidipes* is shown in the figures on plate XXI.

HISTORY OF THE GENUS

Newman described the genus and the species *oculata* in 1838. Fitch, in 1856, described *dorsata*. Stal, in 1862, described the following five species *jocosa, pallidipes, tristis, nasuta* and *flavo-vittata*. Through the courtesy of Mr. China of the British Museum and Doctor Lundblad of the Stockholm Museum, it seems quite certain that *nasuta* is a synonym of *oculata* Newman and, agreeing with Doctor Ball's opinion, the writer believes *flavo-vittata* to be a synonym of *dorsata* Fitch. In 1906 Melichar added *suturalis,* in 1907 Kirkaldy added *mormo*. This brought the genus down to the year 1923 when the first extensive account of the genus was made by Metcalf. In the Fulgoridae of Eastern United States Metcalf gives a key to twelve species of Bruchomorpha, five of which he describes as new. These five were *vittata, bicolor, minima, rugosa* and *decorata*. Doctor Ball and the present writer believe that *bicolor* is a synonym of *vittata*. In 1928, in his paper entitled the "Fulgoridae of Mississippi," Dozier gives a key to eleven species of which one, *bimaculata,* is described as new. Again this species has been placed in synonymy with *jocosa* by Doctor Ball and the present writer. In 1935 Dr. E. D. Ball published a revision of the genus. In his key and notes he lists eleven species, of which *triunata* is described as new. In addition to the synonymy given above he places *minima* Metcalf as a synonym of *mormo* Kirkaldy,

nasuta Stal as a color variety of *oculata* Newman, and he describes two new color varieties of *jocosa* Stal and three new color varieties of *oculata* Newman, two of which, namely *abrupta* and *extensa* the present writer believes to be good species. The present writer, after many years of study of the genus, believes in the validity of fourteen older species, to which is being added six new species, making a total of twenty species in the U. S. North of Mexico at the present time known to collections.

KEY TO SPECIES

1. As viewed from above head extending anteriorly beyond eye a distance equal or greater than the length of eye itself; nasal process distinctly pronounced, 2
   As viewed from above head extending anteriorly a distance less than length of eye; nasal process moderately or not greatly produced 13
2. (1) From a side view length of postclypeus approximately equal to or only slightly longer than width of frontal process at a point in line with apex of frons, 3
   Length of postclypeus at least one-third to three-fourths greater than width of frontal process 4
3. (2) Front in profile slightly elevated before apex; ventral margin of postclypeus straight; black with yellow stripe to end of tegmina; legs black.
   B. suturalis Melichar, p. 103
   Front not elevated before apex; ventral margin slightly concave; stripe to end of tegmina; yellow legs ..... *B. beameri* n. sp., p. 106
4. (2) Nasal process very narrow, truncate; ventral margin of postclypeus straight; a yellow species with two lateral longitudinal dark stripes.
   B. vittata Metcalf, p. 107
   Nasal process rounded across apex; ventral margin of postclypeus concave; mostly dark species with sometimes a median light stripe 5
5. (4) Nasal process viewed from above centrally compressed; lateral carinae sinuate; frontal tablet narrow 6
   Nasal process viewed from above not compressed; lateral carinae not sinuate; frontal tablet broader 9
6. (5) Nasal process bulbous, very long; length of postclypeus not quite twice greater than width of nasal process just anterior to apex of frons; lateral carinae of frons converging considerably posteriorly to apex of frons 7
   Nasal process not bulbous, postclypeus only about one-fourth or one-third longer than width of process at apex of frons; lateral carinae of frons converging just before apex 8
7. (6) Nasal process distinctly bulbous, and rugged; lateral carinae of frons converging considerably before apex at about base of apical fifth; blackish-brown color; legs yellow, streaked with brown ..... *B. nodosa* n. sp., p. 110
   Nasal process not so bulbous, lateral carinae converging at about base of apical seventh or eighth; reddish in color ..... *B. rosea* n. sp., p. 111
8. (6) Ventral margin of postclypeus deeply concave; nasal process slightly bulbous, with a distinct slant; a uniform dark species with only a trace of a median tannish or bronze stripe on head and thorax ..... *B. oculata* Newman, p. 113
   Ventral margin of postclypeus only slightly concave, reddish-brown in color; nasal process not inflated at tip, more truncate across apex; body black with dorsal yellow stripe fading out on abdomen ..... *B. abrupta* Ball, p. 116
9. (5) Large species, black with a contrasting yellow dorsal stripe extending to apex of abdomen ..... *B. extensa* Ball, p. 117
   Smaller species, median dorsal stripe if present bronze, or reddish-tan and ending before the abdomen 10
10. (9) With yellow legs ..... *B. keidensia* n. sp., p. 118
    With black legs 11

11. (10) With ventral margin of postclypeus distinctly concave; light or rusty stripe on head, thorax and somewhat less across tegmina..... *B. bunni* n. sp., p. 119
With ventral margin of postclypeus straighter; the light median dorsal band only on head and thorax 12
12. (11) Median dorsal light band narrow, usually only on frons and vertex; body with lateral margins parallel; venation not so distinct.... *B. minima* Metcalf, p. 121
Median light band broad, distinct, the same width entirely to end of pronotum; venation very distinct ..... *B. tenebrosa* n. sp., p. 122
13. (1) Nasal process short, but very broad, so that the length of the postclypeus is one-half or less than width of process across apex; genitalia with thecal flaps distinctly pointed 14
Nasal process short but not so broad; postclypeus in length approximately equal to process across apex; genitalia with thecal flap rounded posteriorly or truncate; nervures of tegmina pale or yellow..... 16
14. (13) Spotted species with ground color light mottled with fuscous or brown; tegmina coarsely reticulate 15
A large uniform, iridescent black species; ventilation obscure.. *B. tristis* Stal, p. 123
15. (14) Slender insect ..... *B. rugosa* Metcalf, p. 125
Robust insect ..... *B. decorata* Metcalf, p. 126
16. (13) Small species, being 2 mm. or less in length; black in color or with three white stripes; frons perpendicular to body so that nasal process across apex is equal to or less than length of postclypeus; anteclypeus long, equalling postclypeus in length 17
Larger species, females at least over 2 mm. in length; either reddish-brown in color or black with yellow stripe down middle; postclypeus equalling or slightly longer than width of nasal process across apex; anteclypeus shorter than postclypeus 18
17. (16) Frontal tablet very broad, two-thirds as wide as long; body black, legs yellow and fuscous ..... *B. mormo* Kirkaldy, p. 127
Frontal tablet elongate, not as wide as long, species with three stripes.
B. triunata Ball, p. 128
18. (16) Uniform reddish-brown color in females and males, with a dark lateral area on each tegmen, and a conspicuous dark spot on apex of postclypeus.
B. jocosa Stal, p. 129
Uniform black species with a broad dorsal light stripe either on head alone, head and thorax both, or extending also on abdomen; legs yellow..... 19
19. (18) Shining black, dorsal light stripe extending to tip of abdomen or on it; ventral margin of postclypeus rounded; length of postclypeus about three-fourths the width of nasal process and equal to length of anteclypeus.
B. dorsata Fitch, p. 131
Dull black, dorsal light stripe extending merely on head or thorax; ventral margin of postclypeus slightly concave; postclypeus as long as or longer than width of nasal process and at least twice longer than anteclypeus.
B. pallidipes Stal, p. 134

Bruchomorpha suturalis Melichar, 1906

Melichar, Leopold. Abh. k. k. Zoöl. Bot. Ges. Wiener, p. 24. 1906.

Metcalf, Z. P. The Fulgoridae of Eastern North America. Jour. Elisha Mitchell Soc. 38, pp. 139-230. 1923.

Dozier, Herbert. The Fulgoridae or Plant Hoppers of Mississippi. Miss. Agric. Exp. Sta. Bull. 14, pp. 3 to 149. 1928.

Ball, E. D. The Genus Bruchomorpha (Fulgoridae-Homoptera). Bull. Brook. Ent. Soc. XXX, pp. 197-203. 1935.

ORIGINAL DESCRIPTION

"Der *B. dorsata* Fitch ähnlich, jedoch kleiner und nur dadwich verschieden dass her hellgelbe Mittelstreipen sich nicht auf den hinterleibsrücken fortsetzt, der Hinterleib ist daher schwarz, glanzend, höchstene treten zwei kleine hellgelbliche Längsotriche auf

de mersten von den Deckflügeln nicht bedeckten Rückensegmente als Fortsetzung des Mittelstreifens. Die hüften und Beine beim ♂ rötlichgelb, beim ♀ pechbraun. Die Schienen zur Spitze und die Tarsen dunkelbraun. Der unter der Stirne kammartig erhobene Kiel ist äusserst schwach gebuchtet, fast gerade, die ubrigen Merkmale wie bei *B. dorsata* Fitch, vielleicht nur eine varietät von *B. dorsata.*

Länge: ♂ 2½ mm., Breite 1⅓ mm., ♀ 3-3½ mm.

Nordamerika: Zwei Exemplare aus Texas und Zalalreiche. Examplare aus Colorado im Museum in Washington."

AUTHOR'S DESCRIPTION

Size. Length of body from apex of head to tip of abdomen, 1.8 mm. to 2.5 mm. Greatest width of body, 1 mm. to 1.4 mm. Length of tegmen, 1 mm. to 1.2 mm.

Color. General color pitch brown with a conspicuous dorsal contrasting pale-yellow stripe; this stripe narrowed at apex of frons, on vertex about one-third of total width, the same width on thorax as on vertex, again narrowing to half this wide on the combined claval margins. The abdomen pitch brown, occasionally with a faint indication of yellow on first abdominal segment, under side of body pitch brown except less sclerotized areas of thorax and sometimes the clypeus. Legs, especially of females, dark brown, sometimes yellow on apical half of coxae and basal half of tibiae.

Structural details. One of the short-nosed species in the genus with the frons extended cephalad a distance equal to length of one eye. A median carina present on frons, but less distinct than in some species; two outwardly curving lateral carinae which meet the median carina just posterior to apex; a series of round pits present between the lateral carinae and eyes, a row of eight just laterad of each lateral carina and a row of four against the eye. The frontal suture raised on a slight carina which is not so shelflike as in *oculata.* The antennae, therefore, not in such a deep pocket as in that species. The ventral margin of the postclypeus straight, its length as measured from anteclypeus to apex approximately equalling width of frontal process at its apex. Vertex short, about six times wider than long, transversely concave and with a median carina. Pronotum characteristic of the genus, practically covered at sides by the eye, arched forward between eyes for a distance about two-thirds length of eye, the median carina less distinct than in some species, each lateral dorsal third covered by approximately twenty-four round pits; the extreme sides of pronotum extended below eye

into the characteristic flap which in this species is distinctly angulate on ventral margin and bears two rows of circular pits. Mesonotum conspicuous, not as broad as in some species, less than twice wider than long, the median carina less distinct, two sharp laterally convex, lateral carinae present, laterad of which are numerous round pits, numbering between 14 and 20. Tegmina rugulose, a few longitudinal veins elevated more distinctly above the network, in length extending about three-fifths of the length of the abdomen. About four abdominal segments visible from above, a distinct carinae on lateral side of each segment just back of posterior margin, closely followed by two rows of circular pits.

Male genitalia. Tenth abdominal segment (anal flap) tubular at base, then with posterior ventral margin extended into a roundingly pointed flap, which is slightly longer than the basal tube. A small portion only of the eleventh segment visible beyond the dorsal margin and bearing a short, pointed flap.

Each harpago, as viewed from a flattened lateral view, a rectangular plate with its basal fifth prolonged cephalad into a slender pointed handle and its apical two-fifths greatly prolonged as a sharply pointed process which curves directly cephalad.

The bilaterally symmetrical aedeagal process is characteristic for the genus. The theca covers the aedeagus through the middle as a snugly fitting membranous sleeve narrowed at base and with its ventral median region extended caudad as two truncate flat lobes which curve slightly cephalad, leaving a notch on each side from which protrudes a sharply pointed, well-sclerotized aedeagal process. The well-sclerotized aedeagus is hidden except at base and for this process mentioned above.

Comparative notes. This species resembles *B. minima* Metcalf and *B. beameri* n. sp. It is easily separated from either by its snub-nosed appearance, which is due to the frontal process being distinctly elevated at tip and by having the ventral margin of postclypeus straight. From *B. minima* it is furthermore separated by the median yellow stripe while *minima* is an entirely black species. From *B. beameri* it is separated in color by having black or darkish legs, while the latter has yellow legs.

Because of its black legs it might easily be confused with *B. bunni* and *B. tenebrosa*. For comparison with those species see notes under the descriptions of these species.

Notes on distribution. Melichar lists Colorado and Texas as the type localities. Dozier cites records of specimens taken in North

Carolina and Florida and states that he collected one specimen from Mississippi. The present writer has studied a series of specimens taken from the following places; in New Mexico from Portales, Silver City, Tucumcari, Vaughn, and Santa Fe; Wichita, North Fork, Oklahoma; Ashford and Flagstaff in Arizona.

Bruchomorpha beameri n. sp.

ORIGINAL DESCRIPTION*

Size. A medium sized species with a medium length nasal process. Length of body from apex of head to tip of abdomen, 2.4 mm. to 3.3 mm. Greatest width across abdomen, 1.6 mm.

Color. General color metallic black. A conspicuous, cream-colored median stripe extending across frons, thorax and to tip of tegmina on which it tends to fade out at apex. Legs of male yellow except for last segment of tarsi and tips of spines. Legs of female yellow with basal half of coxae washed in fuscous, and femora and tibiae striped on each side with reddish-brown.

Structural details. This species has a medium-length nasal extension. From above the frons extends a distance slightly greater than length of eye in male and about one and one-half times in female. A median carina is distinct on frons, pronotum and mesonotum. Frontal suture less elevated and antennae not so depressed in a socket as in other species. Ventral margin of postclypeus concave, its length as measured from anteclypeus to apex only slightly greater than width of frontal process at a point in line with the joining of lateral frontal carinae. The elevated lateral boundaries of head above eye not so shelflike as in *oculata*. Vertex broad, about eight times wider than median length. Median carina of pronotum distinct, pits in each lateral third indistinct, numbering approximately 19, at sides pronotum entirely superimposed by eye, below which it broadens into a slightly angulate flap which extends forward as far as antennae and anterior border of eye. Mesonotum with a median and two lateral carinae well pronounced, each lateral third bearing about twelve round pits. Tegmina rugulose, scarcely any longitudinal veins distinct.

Male genitalia. Tenth abdominal segment (anal flap) tubular at base, then with posterior ventral margin extended into a roundingly pointed flap which is about twice longer than the tubular base. A tubular part of the eleventh segment only visible beyond the dorsal posterior margin of the tube.

* The writer is especially indebted to Mr. Ralph Bunn of the Bureau of Entomology for first recognizing this species as new, and who in preliminary manuscript form, which he bequeathed to the writer, had given this name to the species.

Each harpago as viewed from a flattened lateral view semicircular in outline, very broad through middle, and with its apical dorsal angle extended into a sharply pointed process which is more slender and shorter than in *suturalis*.

The bilaterally symmetrical aedeagal process is characteristic for the genus. The theca covers the aedeagus through the middle as a snugly fitting membranous sleeve somewhat narrowed at base and with the ventral median margin extended caudad as two truncate flat lobes, each of which is as long as the tubular sleeve of the theca. Between the lateral notch of the thecal process is visible a sclerotized, slender aedeagal process.

Comparative notes. Superficially this species resembles the *B. dorsata* Fitch group, but is separated from that group, which is a short-nosed group, by its longer nasal process. For comparison with *B. suturalis* Mel., which it closely resembles, see the notes under this heading in the description of that species.

Location of types and distribution. Holotype male and allotype female, collected by R. H. Beamer at Merritt, B. C., August 3, 1931. Paratypes from the following places, all collected by R. H. Beamer: 11 females and 9 males from Merritt, B. C., August 3, 1931; Hartney, Man., 2 males on July 31, 1937; Bozeman, Mont., four females on August 13, 1931; Missoula, Mont., 2 females and one male on August 11, 1931; Knox, N. Dak., one male and one female, on July 28, 1937; Hamar, N. Dak., 6 females and 6 males on July 27, 1937; Leonard, N. Dak., one female on July 25, 1937; from Nicolans, Cal., one female and one male on July 27, 1935; and Cochise, Ariz., 5 males on July 20, 1927. Mr. Paul Oman collected paratypes at Bringame, Cal., 2 females and 5 males on June 15, 1935, and C. L. Johnston 5 females at Hartney, Man., July 31, 1937.

Bruchomorpha vittata Metcalf, 1923

Metcalf, Z. P. The Fulgoridae of Eastern North America. Jr. Elisha Mitchell Soc., p. 186, 1923. Includes *B. bicolor* Metcalf, 1923, which is the brachypterous form of the species.

Dozier, Herbert. The Fulgoridae or Plant Hoppers of Mississippi. Miss. Agric. Exp. Sta. Bull. 14, pp. 3 to 149, 1928 as *B. bicolor* Metcalf.

Ball, E. D. The Genus Bruchomorpha Newman (Homoptera-Fulgoridae). Bull. Brook. Ent. Soc. XXX, No. 5, pp. 197-203.

Comparative notes. In the original description Metcalf states that this species may be recognized by its shortly produced nasal process and elongate frons. The writer considers that this is slightly misleading in that the nasal process, although not as long as the *oculata* group, is much longer than the short-nosed group represented by *dorsata*. The frons itself is not so greatly lengthened, being only slightly longer than the length of the eye as viewed from

above, but the postclypeus is very elongate, its ventral margin being slightly over twice the length of either the anteclypeus or the width of the nasal process at apex. A distinctive feature of this species is the much narrowed nasal process which is distinctly truncate and not rounded at apex as in *oculata*. Other structural distinctions are the less elevated frontal sutures so that the genae are proportionally broader and not deeply sunken, the longer vertex, which is only four times wider than greatest length and through middle twice as long as at sides, due to the lateral fourths of the anterior margin sharply bending caudad, the lack of any well-pronounced median carina on frons and thorax, two lateral carinae present on mesonotum, the tegmina smoother with less reticulation of veins showing than in most species, a faint median carina present on each anterior abdominal segment.

Coloring distinctive, being a striped species with ground color yellow and two narrow brown stripes running lengthwise of body.

Notes on distribution. Type locality is Brownsville, Tex. Doctor Metcalf sent a paratype female to the writer for study, which bore the label "palm jungle sweepings." In addition the writer had eight specimens in all for study, of which seven were from Brownsville and one from Progress, Tex. Apparently this is an exceedingly rare species.

Notes on synonymy. Metcalf described *B. vittata* only from macropterous forms. These were taken at the same time and place as *B. bicolor* Metcalf. Since macropterous forms are comparatively scarce in either species, it is difficult to get comparisons on this species. Doctor Ball states that, "All long winged forms have practically the same dark color, and that they all have much enlarged mesonotal protuberances and consequently notched pronotums. The form of the nasal process is, however, distinctive." He therefore believes that *B. vittata* and *B. bicolor* are long and short-winged forms of the same species and that since *vittata* was listed first, the species becomes *vittata* with *bicolor* thrown into synonymy.

In support of this idea is the fact that they were taken together and that in the original descriptions Metcalf states that they have elongate fronts, and shortly produced truncate nasal processes. In comparing macropterous forms of other species the writer has found that the shape of the nasal process and coloring always follows closely that of the brachypterous forms. The situation became complicated by the fact that Doctor Metcalf sent the writer a brachypterous female specimen of *vittata* (hitherto only described from ma-

cropterous forms) which bears the label Medicine Hat, July, Alta. 24, F. S. Carr. This specimen evidently was subsequently determined by Doctor Metcalf as this species. It is entirely different in coloring and body structures from a type specimen of *bicolor*. Since it is a moderately long-nosed specimen, the present writer identifies this specimen as *B. beameri* n. sp. The original descriptions of Metcalf's two species are given below.

ORIGINAL DESCRIPTION OF B. VITTATA METCALF, 1923

"This species may be recognized by its elongate narrow front, short, nearly truncate nasal process.

"Vertex rather broad, the lateral margins converging to the intermediate carinae, the anterior margin nearly straight; frons rather elongate, narrow; the intermediate carinae slightly arched, the nasal process short, but little produced, nearly truncate anteriorly. Pronotum broadly rounded anteriorly, deeply, almost triangularly emarginate posteriorly. Mesonotum ecarinate, the disk broadly arched, the scutellar portion flat, produced. Macropterous wings narrow, elongate.

"*Color.* General color dull blackish fuscous; eyes grayish-brown; median frontal stripe evident, extending to the posterior border of the pronotum. Mesonotum and abdomen paler, median stripe narrower. Macropterous wings smoky hyaline; legs pale yellowish testaceous; all the femora and fore tibiae washed with brownish fuscous.

"Length, macropterous form, apex of head to apex of abdomen, 3 mm.; apex of wings, 4.20 mm.

"Holotype ♀, Brownsville, Tex., 1911. Paratypes 2 ♀ ♀, Brownsville, Tex., 1911. In the collection of Illinois State Lab. Nat. Hist."

ORIGINAL DESCRIPTION OF BRUCHOMORPHA BICOLOR METCALF

"This species may be recognized by its shortly produced nasal process, elongate frons, general pale yellow color and two broad, black stripes extending from the apex of the nasal process across the eyes to the apex of the abdomen.

"Vertex short, the anterior margin broad, nearly straight; frons elongate, the intermediate carina broadly arched basally, then converging straight to the apex of the frons; nasal process elongate, bluntly triangular, the ventral margin not sinuate. Pronotum broadly rounding anteriorly, broadly sinuate posteriorly, about half as long as the mesonotum; disk of the mesonotum broad, the

lateral carinae evident, the intermediate carina faint; male genital styles broad at base, gradually narrowed apically, the apex produced, short triangular teeth directed anteriorly.

"*Color.* General color pale dull yellow, a broad blackish fuscous stripe on each side of the body extending from the apex of the nasal process across the compound eyes, the disk of the wings and then converging to the apex of the abdomen; meta-pleura black, a narrow, black stripe on the lateral ventral margins of the abdomen, spines and claws of the legs black; genitalia black.

"Length of male, 2 mm.; genitalia black.

"Holotype ♂, allotype ♀, paratypes 5 females, Brownsville, Tex., Nov. 2, 1911."

Bruchomorpha nodosa n. sp.

ORIGINAL DESCRIPTION*

Size. Larger than *B. oculata* New. Length of body from apex of head to tip of abdomen, 3.29 mm.; width across abdomen, 1.43 mm.

Color. Black with a metallic luster, head and thorax lighter, somewhat reddish-brown. A rusty-yellow stripe following median carina from tip of frons, across vertex to margin of mesonotum. Tip of nasal process black, rest of head at sides and below reddish-brown in sharp contrast to black body; anteclypeus and beak tan. Legs yellow and rusty-brown streaked.

Structural details. This species is characterized by the exceptionally long nasal process which is unusually inflated through apical region, giving it a knoblike appearance, and by the arched dorsal outline of body with the nasal process greatly deflected. As viewed from above the nasal process extends beyond eyes twice the length of the eye, approximately halfway of frons, being deeply depressed, and lateral margins conspicuously constricted, making the frontal plate violin-shaped and lateral carinae converging considerably before apex and about base of apical fifth. Median carina of frons through depressed area indistinct; carinae of pronotum and mesonotum distinct. Frontal suture less elevated, antennae not inserted in a particularly deep pocket. Ventral margin of postclypeus deeply concave, to length as measured from anteclypeus to apex approximately twice the width of frontal process at a point in line with the joining of the lateral frontal carinae above. Thorax

* The writer is especially indebted to Mr. Ralph Bunn of the Bureau of Entomology for first recognizing this species as new, and who in preliminary manuscript, which he bequeathed to the writer, had given this name to the species.

and abdomen evenly humped through middle, nasal process and tip of abdomen distinctly deflected, giving the body as viewed from the side a more pronounced, half-moon shape than in other species.

Comparative notes. Similar to *B. oculata* New., but differentiated by the elongate, inflated and greatly deflected nasal process, which is conspicuously depressed across middorsal region, and with the lateral carinae of frons meeting considerably caudad of apex of nasal process. Usually easily recognized, in addition, by the conspicuous red coloring on the ventral head region.

Location of types and notes on distribution. Male holotype taken at Peeler, Texas, June 26, 1938, by R. H. Beamer, and female allotype at Natchitoches Parish, Louisiana, August 16, 1938, same collector. The following paratypes taken by R. H. Beamer in Texas; four females, Peeler, June 26, 1938; three females at Sequin, June 26, 1938; one female at Karnes county, Texas, August 23, 1928; and one female at Victoria county, Texas, August 1, 1928. Other paratypes: Four females at Natchitoches Parish, Louisiana, August 16, 1928, by R. H. Beamer; and from Kansas, one female, Montgomery county, by Beamer and Lawson, August 3, 1923; one female in Cowley county, September 11, 1926, by E. P. Breakey; one female in Chautauqua county, same collector, September 9, 1926; two females in Phillips county, July 8, 1925, by R. H. Beamer; and one female, Scott county, August 23, 1928, by R. H. Beamer.

The types are in the Snow Entomological Collection at the University of Kansas.

Bruchomorpha rosea n. sp.

Size. Length of body from tip of head to apex of abdomen, 2 mm. to 3.2 mm. Greatest width of body as viewed from above, 1 mm. to 1.5 mm. Length of tegmen, 1 mm. to 1.2 mm.

Color. A reddish-tan species becoming darker at the sides, in general color closely resembling *jocosa*. Frons reddish-tan, lateral margins and carinae dark brown, an indefinite yellowish median streak which extends across the thorax where it widens somewhat. Underside of head reddish-brown with extreme tip of nasal process black. Eyes dark brown or black. Thorax from above reddish-brown, washed in fuscous at sides. Tegmina uniform reddish-brown except mesal margins fading to yellow. Abdominal segments tannish to reddish-brown with posterior margins edged in dark brown. Legs amber yellow.

Structural characteristics. A long-nosed species with head produced beyond eye, as viewed from above twice the length of the

eye. Frons centrally compressed through the middle, a median carina slightly indicated, two distinct lateral carinae which distinctly bend inwardly at middle. Nasal process as viewed from the side long; postclypeus three-fourths to twice the width of the process at a point in line with apex of frons, its ventral margin moderately concave. Pronotum from above short, its median length about two-thirds the length of the eye, laterally reduced behind eyes to a thin margin, then on sides broadening into spatulate earlike lobes which circumscribe the eyes; on each lateral dorsal disk sixteen or seventeen circular pits. Mesonotum large, about twice as wide as long, a median carina present and on each lateral disk about twelve circular pits present. The characteristically abbreviated tegmina shining semitranslucent, wing venation very obscure, giving only a pebbled appearance. Abdomen globose, about four segments visible from above; on the segments which are exposed a lateral carina indicated just posterior to anterior margin of segment; usually four round pits present just posterior to the carina.

Male genitalia. Tenth abdominal segment (anal flap) with a short, tubular base which is about one-fourth of the total length of the process. The posterior ventral margin of the tube is expanded caudad into a roundingly pointed flap. The eleventh segment is ringlike and is scarcely visible beyond the dorsal posterior margin of the tube and bears a short dorsal stylus.

Each harpago, as viewed from a flattened lateral view, is somewhat crescent-shaped, broadest through approximate middle, with its basal part arm-shaped and its apical third greatly lengthened and projected dorsad as a sharply pointed, slightly recurved hook.

The aedeagus is nearly hidden by the less sclerotized theca, the latter fitting over the aedeagus through the middle as a tight sleeve which broadens apically and also has its ventral apical margin expanded caudad as two rounded flaps which bend somewhat dorsad, thus leaving a notch on each side, from which protrudes a pointed, slender, well-sclerotized aedeagal hook.

Comparative notes. Size and coloring of *jocosa* Stal, but easily recognized by its long nasal process as opposed to the very short one of *jocosa*. It is easily distinguished from all other species in the genus by its rosy coloring.

Notes on types and distribution. Holotype ♂ and allotype ♀ collected by R. H. Beamer at Castroville, Texas, on July 5, 1936. One other paratype female collected by Paul Oman at Faraway Ranch in Arizona, June 10, 1933. Thirty-three paratype males collected by R. H. Beamer from August 2 to 6, 1936, from the following places

in Texas: Pecos, Concan, Loyal Valley, Elmendorf, Boerne and San Antonio. Two paratype males collected in August, 1935, by R. H. Beamer from Hereford and Cochise counties, Arizona. One male paratype collected by R. H. Beamer, June 4, 1933, at Tucumcari, New Mexico.

The types and most of the paratypes are deposited in the Snow Entomological Museum, University of Kansas.

Bruchomorpha oculata Newman, 1838

Newman, Edward. Ent. Mag. V, p. 399, 1838.

Stal, Carolus. Novae vel minus cognitae Homopterum formae et species. Berl. Ent. Zeit. VI, p. 310, 1862. As *B. nasuta.*

Metcalf, Z. P. The Fulgoridae of Eastern North America. Jour. Elisha Mitchell Soc. 38:139-230. 1923. As *B. nasuta* Stal.

Dozier, Herbert. The Fulgoridae or Plant Hoppers of Mississippi. Miss. Agric. Exp. Sta. Bull. 14, pp. 3 to 149. 1926. Also includes *B. nasuta* Stal.

Ball, E. D. The Genus Bruchomorpha Newman (Homoptera-Fulgoridae). Bull. Brook. Ent. Soc. XXX, No. 5, pp. 197-203. 1935. As *B. oculata* var. *oculata.*

REVISED DESCRIPTION

Size. Length of body from tip of head to apex of abdomen, 1.8 mm. to 3 mm. Greatest width of body as viewed from above, .92 mm. to 1.4 mm. Length of tegmen, .9 mm. to 1.2 mm.

Color. A shiny, metallic, black species usually marked with rust. Frons as viewed from above blackish-brown except for a yellow to rust median stripe which borders the brown median carina; this same band and carina continued across vertex and pronotum. Eyes pitch brown, margined in rust. Clypeal region and posterior part of gena reddish-yellow in female; in male same pitch brown as rest of head. Thorax from above reddish-brown except for median light stripe and a faint lighter spot on pronotum behind each eye; lateral sclerites of thorax uniform black brown; membranous ventral parts yellow. Tegmina blackish-brown with a metallic lustre and a faintly lighter claval margin. Legs yellow to reddish-brown, washed in dark, especially near the base of each segment or in the form of dark, longitudinal bands. Abdomen from beneath pitch brown.

Structural characteristics. One of the moderately long-nosed species in the genus. As viewed from above the frons is produced anteriorly one and one-half to twice the length of the eye, its frontal tablet about two-thirds longer than its greatest width and a distinct median carina present laterad of which on each is a slightly less prominent, outwardly curving carina, frequently interrupted or at least constricted halfway from the apex at which place the frons is depressed; the frontal sutures forming the lateral boundaries of the head as viewed from above are elevated on a conspicuous carina

which extends shelflike over the gena, thus forming a pocket in which lies the antenna. The ventral margin of postclypeus is distinctly concave, its length at this point not quite twice the width of the nasal process just anterior to apex of frons. The labrum is abbreviated to a tiny triangular sclerite. Pronotum from above short, its median length about two-thirds the length of the eye, laterally so reduced behind the eyes that the posterior margin only shows at this point; each lateral disk with 16 round pits; on the extreme sides expanded into broad plates which curve around the eyes and end at the bases of the antennae and on each lateral plate a row of four circular pits following the posterior margin. Mesonotum large, about twice as wide as long, on each side bearing nine round pits, a thin median carina present. Tegmina abbreviated, extending only slightly beyond middle of abdomen. Venation obscure, the whole surface of the tegmen roughened by the indistinct veins, giving it a pebbled appearance. Abdomen globose, only about four segments showing from above; on the first few segments a lateral carina indicated just posterior to anterior margin of segment; usually three to four pits present just posterior to the carina.

Male genitalia. Tenth abdominal segment with ventral margin extended into a roundingly pointed flap, its length about one-fifth longer than wide. Eleventh abdominal segment typically ringlike, only showing a slight distance beyond dorsal margin of the tenth segment and bearing a long fingerlike stylus.

Each harpago, as viewed from a flattened lateral view, roughly crescent-shaped, its basal fourth slenderly pointed, the median region with ventral margin greatly expanded, the apical fourth curving dorsad as a slenderly pointed elongate hook.

The bilaterally symmetrical aedeagal process is difficult to follow due to its minute size and the fact that it is covered so completely by the theca. The theca covers the aedeagus through the middle as a snugly fitting, membranous sleeve whose ventral margin is extended caudad into two flat, spatulate processes about equal in length to the basal collar and having their roundingly pointed apices directed dorsad. The sclerotized tubular aedeagus is only visible between the collar and the lobes of the theca. At this point can be seen the bases of a sclerotized hook which is directed cephalad under the thecal collar and ends just inside the basal margin of the theca.

Synonymy. In the literature two species of Bruchomorpha from northeastern and central United States have always been listed in keys, namely *B. oculata* and *B. nasuta*. With large series of speci-

mens it was always difficult to try to distinguish these two species. Therefore, the writer endeavored to clear up this situation by studying the types. Through the efforts of Dr. H. B. Hungerford, Doctor Lundblad, of the Stockholm Museum, kindly sent the type of *B. nasuta* Stal for study. This proved to be the form which has usually been identified as *B. oculata* Newman. The writer sent a close homotype of *B. nasuta* Stal to Mr. China of the British Museum, hoping that he would be able to compare it with the *oculata* type. After studying the question Mr. China sent the following reply to the author:

"The type of *Bruchomorpha oculata* has been lost. It is not in our collection here nor at Oxford. According to Newman it was originally in the collection of the Entomological Club, but this collection was presented to the British Museum in 1844, so that the type should be here. I have been unable to trace it, however. We have under this name a single specimen labeled *Bruchomorpha oculata,* but it does not agree with the original description of *oculata* and was collected by E. Doubleday at St. Johns Bluff, East Florida, instead of by Foster at Mount Pleasant, in Ohio, as was Newman's specimen. Your specimen labeled *B. nasuta* agrees very well indeed with Newman's description and figures. The lateral carina of frons is pinched in and the ventral margin of the postclypeus is strongly concave. He describes the colour as 'shining greenish bronzy-black,' which would cover the metallic bluish black of your specimen since the green and blue metallic colours are interchangeable. Bronzy in this description really refers to the metallic sheen and not to the brown colour of bronze. I should not hesitate in identifying your *B. nasuta* as *oculata* Newman."

The writer believes, as does Mr. China, that Stal's *nasuta* is a synonym of *B. oculata*, and many difficulties can be cleared up with this solution. Metcalf's (1923) drawing of *B. nasuta* is correct for this species. It is not plain what his *B. oculata* is. Dozier's description of *B. oculata* is correct for this species. No specimens have shown up for his *B. nasuta* Stal as a distinct thing from *B. oculata.*

Comparative notes. This species resembles *B. nodosa* n. sp., *B. minima* Metcalf and *B. abrupta* Ball more than other species in the genus. For comparison with *nodosa* see the notes under this heading in the description of that species. From *minima* it is easily separated by having light colored legs instead of black ones as in *minima.*

For comparison with *abrupta* see notes in the description of that species.

Notes on distribution. Dozier (1926) states that this is the most common species of the United States, being widely distributed both in Canada and the United States. The writer has studied specimens from the following places: New Haven, Connecticut; Gary,

Indiana; Douglas county, Kansas; Naples, Maine; Thompson and Cedar River, Michigan; Cooley, Caso Lake and Shevlin, Minnesota; Columbus, Mississippi; Bretton Woods, Notchland, Crawford Notch and Bath, New Hampshire; Erie, Pennsylvania; Windsor, Vermont; Brule and Luxemburg, Wisconsin.

Bruchomorpha abrupta Ball, 1935

Ball, E. D. The Genus Bruchomorpha Newman (Homoptera-Fulgoridae). Bull. Brook. Ent. Soc. XXX, No. 5, pp. 197-203, as *B. oculata* var. *abrupta*.

Comparative notes. Doctor Ball described this species merely as a variety of the species *oculata* Newman. He states that this species has nearly the form of *nasuta* Stal (*beameri* n. sp. in this paper), but is larger, with a narrower, rounder nasal protuberance. In his key he separates this from *B. oculata* var. *oculata* by having a black body with a broad, white dorsal stripe, but in his description states that the stripe is definite but narrower and reddish, often not extending onto the abdomen.

The writer finds that this species more closely resembles *B. oculata* Stal than any other. From this species it is separated by having the nasal process more truncate and broader at apex at a point in line with end of frons while in *oculata* the end of the process is more sloping. The characteristic white stripe which Ball describes is not so apparent in the specimens which the writer studied. The dorsal stripe was more often, at least for the females, more dusky cream to rust, as in *oculata*, than white. It can be told, however, from *oculata* in color by having the postclypeus reddish-brown and the general body color being dull black rather than shining bluish-black, and also the dorsal stripe is much more in evidence than in *oculata*.

The size of the females from apex of head to apex of abdomen is about 2.8 mm. to 3 mm.

Male genitalia. Tenth abdominal segment (anal flap) tubular at base then extended on its ventral side into a roundingly pointed flap which is not quite twice as long as the tube. The stylus of the eleventh segment is a fingerlike projection extending beyond the dorsal margin of the tube.

Each harpago as viewed from a flattened lateral view is broadest through the middle where its ventral margin is greatly curved. The basal third forms a slender arm and the apex is extended dorsad as a sharply curved, serrate and finely pointed process.

The aedeagus is typical for the genus. The theca covers the aedeagus itself through the middle as a tight membranous sleeve,

then on its ventral margin projects caudad as two roundingly spatulate processes which curve dorsad so that their dorsal margins are in line with the thecal margin.

Notes on distribution. Doctor Ball described the holotype ♀, allotype ♂ and eight paratypes from Sanford, Florida. He states that this is a fairly common summer form in the gulf region.

The writer studied specimens from Beeville, Castroville, Pecos, Alice, San Antonio and Boerne, Texas, and a few from Elmendorf, New Mexico.

Bruchomorpha extensa Ball, 1935

Ball, E. D. The Genus Bruchomorpha Newman (Homoptera-Fulgoridae). Bull. Brook. Ent. Soc. XXX, No. 5, pp. 197-203 as *B. oculata* var. *extensa.*

Comparative notes. Doctor Ball considered this merely as a variety of *oculata.* It is easily distinguished from this species, as he pointed out, however, by its larger size, the more foliaceous nasal process and the broad, creamy dorsal stripe which extends from apex of frons to apex of abdomen.

This species measures 2.8 mm. to 4 mm. in length from apex of head to apex of abdomen in females and 2.8 mm. for males.

The present writer considers that this species superficially resembles *B. dorsata* Fitch more than it does *oculata* because of the presence of the broad, creamy dorsal stripe. On closer examination it is easily distinguished from *dorsata* because the latter has an abbreviated nasal process.

Male genitalia. The tenth abdominal segment is very small, scarcely visible beyond the ninth segment. Each harpago as viewed from a flattened lateral view is broadest through the middle where its ventral margin is greatly curved. The basal third tapers to a bluntly pointed base. The dorsoapical angle is extended dorsad as a long slender, curved, sharply pointed process.

The aedeagus is the typical type for the genus. The theca covers the aedeagus through the middle as a tight sleeve, then is extended on the ventral apical region into two flat, spatulate lobes whose width is greater than their length.

Notes on distribution. Doctor Ball's type locality for the female was Granite Dell, Arizona, and for the male Ashfork, Arizona. He states that this species is found sparingly in the Gulf region and extends through to southern California and north into Utah.

The present writer studied specimens from Pecos, Castroville, Alice, Boerne and San Antonio, Texas, and from Elmendorf, New Mexico.

Bruchomorpha keidensia n. sp.

ORIGINAL DESCRIPTION

Size. Length of body from apex of head to apex of abdomen, ♀ 2.8 mm. and ♂ 2.2 mm.; greatest width of body, ♀ 1.6 mm. and ♂ 1.1 mm.; length of tegmen, ♀ 1.2 mm. and ♂ 1.2 mm.

Color. A black species similar to *B. oculata* in general color characteristics. From above all black, this black dull, brownish-black rather than the blue-black or bronze tone of *oculata,* except for a well-pronounced median stripe of yellowish-tan, starting on the frontal tablet, extending across thorax and somewhat indicated on the median margins of the tegmina, occasionally the stripe a duller reddish-brown or even almost lacking. Underside dark except postclypeus and legs, which are yellow, occasionally washed in fuscous.

Structural details. General appearance similar to *B. oculata* Newman. From above head protruding beyond eyes about one and one-half times the length of eye. Vertex depressed, exceedingly broad, about eight times wider than length. Frons from above with distinct median carina present and two distinct lateral carinae which are straight, not constricted through middle and frons not depressed as in *oculata;* the frontal tablet only approximately one-third longer than its greatest width. From side view nasal process long, the lateral carinae converging just posterior to apex, at this point the dorsal margin sloping downward, giving a narrowed look to apex not found in *oculata.* Ventral margin of postclypeus angulately concave, its length about twice the length of the anteclypeus. Pronotum and mesonotum with a distinct median carina, latter with additional pair of curved lateral carinae, the characteristic round pits on lateral disks of both segments. Tegmina with venation entirely obscured, heavily rugulose, in the female extending only slightly beyond the middle of abdomen, in the male a little longer. Abdomen characteristically globose, only about four segments visible from above; on the exposed segments, a carina indicated on each side, closely followed by a row of circular pits which usually consists of four or five by the median half of the carina and one or two at the extreme lateral edge.

Male genitalia. Tenth abdominal segment (anal flap) with ventral margin extended into a roundingly pointed flap, the whole structure about twice longer than wide. Eleventh segment showing about the usual length beyond the dorsal edge of the tenth segment.

The shape of the harpago and the aedeagal structure with the slight variations and ways they differ from *B. oculata* and related forms can best be studied by looking at the drawings of these structures.

Comparative notes. This species resembles *B. oculata* and *B. bunni* more than any other species in the genus. In color it differs from *oculata* by being a dull brown-black rather than metallic bluish or copper-black and by having usually a well-pronounced median yellow-tan stripe across frons, thorax, and even on to the tegmina. In *oculata* this stripe is scarcely ever extended on to the mesonotum. Structurally it is distinguished in the following ways: The frontal process is narrowed due to the apical dorsal margin sloping more abruptly than in *oculata;* the lateral frontal carinae are not sinuate, the frons is not depressed and the frontal tablet is only approximately one-third longer than its greatest width while in *oculata* it is two-thirds or more.

For comparison with *bunni* see the discussion under this heading in the description of that species.

Types and distribution. Male holotype and female allotype collected by R. H. Beamer on August 8, 1937, at Keid, Manitoba. A series of thirty-five paratypes, both males and females, taken by R. H. Beamer and C. L. Johnston, same place, and a series of thirty, both sexes, taken by same parties at Mafeking, Manitoba, on August 3, 1938.

Bruchomorpha bunni n. sp.

ORIGINAL DESCRIPTION

Size. Length of body, 2.4 mm. to 3.2 mm.; width of abdomen, 1.1 mm. to 1.7 mm.

Color. Entire body and legs jet black, shiny with a metallic luster, except for a narrow, rusty-yellow stripe extending from just back of the apex of the frons, across the vertex, pronotum and mesonotum and continued as a very faint line across the inner margin of the elytra.

Structural details. Nasal process of median length. From a dorsal view, head extending beyond eye a distance equal to length of eye. Lateral carinae of frons not sinuate, shape of frons top-shaped. Median carina of frons, pronotum and mesonotum distinct. Tip of nasal process somewhat narrowed at apex, not extended beyond point where lateral carinae of frons converge. At this point the width of the frons is two-thirds the length of the ventral margin of

the postclypeus. Postclypeus deeply concave. Tegmina moderately long, no distinct longitudinal veins or cells, the entire surface pebbled.

Male genitalia. Each harpago as viewed from a flattened lateral view with both dorsal and ventral margins greatly curved outwardly, giving it a bulbous appearance, the apical dorsal angle extended into the usual sharply pointed recurved process, which is comparatively shorter than in many species.

The aedeagal structure is typical for the genus with the sleeve of the theca in this case almost square and the extended ventral flaps likewise subequal in length and width. The aedeagus bears two distinct, sharply pointed processes which are exposed through the narrow slit between the theca process and the thecal flap.

Comparative notes. A black species with median rusty stripe extending on to abdomen, usually to apex. Size: Length of body, 2.4 mm. to 3.2 mm.; width, 1.1 to 1.7 mm.

This species is similar in coloring and superficial appearance to the following species: *B. oculata, B. keidensia, B. tenebrosa, B. minima* and *B. suturalis.* From *oculata* it is distinguished by having black legs instead of yellow or light brown and by the carinae of the frons being straight instead of sinuate.

From *keidensia* it is separated again by its black legs.

From *tenebrosa* it is separated by the less distinct venation and rugose tegmina and by having the ventral margin of the postclypeus more concave.

From *minima* it is separated by its larger size, the median light stripe extending on to abdomen, its concave ventral margin of postclypeus and its body not so parallel-sided.

From *suturalis* it is easily distinguished by lacking the broad, turned-up nasal process of that species.

Location of types. Holotype male, taken at Grand Canyon, Arizona, on August 11, 1927, by R. H. Beamer; allotype female, Grand Canyon, August 11, 1927, by P. A. Readio. Two female paratypes and nine male paratypes, same data. One female paratype collected in Cochise county, Arizona, by R. H. Beamer, July 20, 1927, and one male at Taos, Taos county, New Mexico, by R. H. Beamer, August 20, 1927.

The types are in Snow Entomological Collection at the University of Kansas.

NOTE.—This species has been named in honor of Mr. Ralph Bunn, who for several years was interested in the revision of this genus. Although Mr. Bunn was unable to complete his studies due to pressing duties in other fields, he

made a valuable contribution to the present work by recognizing four new species for which he gave manuscript names, as has been pointed out elsewhere in this paper. The present writer is indebted to Mr. Bunn for turning over entirely for use in this paper all the data which he had completed to date.

Bruchomorpha minima Metcalf, 1923

Metcalf, Z. P. The Fulgoridae of Eastern North America. Jr. of Elisha Mitchell Soc., p. 187.

Ball, E. D. The Genus Bruchomorpha Newman (Homoptera-Fulgoridae). Bull. Brook. Ent. Soc. XXX, No. 5, pp. 197-203, 1935. As *B. mormo* Kirkaldy.

Comparative notes. A small, black species measuring from 1.9 mm. to 2.4 mm. in length and .93 mm. to 1.33 mm. in width across abdomen. This species very closely resembles *B. oculata* Newman. The two species are about the same size in actual measurements although in looking at a long series of both species *B. oculata* tends to run larger. In color *B. minima* is one of the darkest species in the genus, being entirely black with black legs, except occasionally a rusty stripe on frons and thorax. It closely resembles *B. oculata* in coloring and size, being separated mainly from the latter by having black legs instead of yellow. It closely resembles *B. bunni,* but is separated from it by lacking the distinct median yellowish-red stripe and by its narrower frontal process. The postclypeus in *minima* and *oculata* is one-third longer than the frontal process across apex in line with apex of frons, while in *bunni,* it is less than this. This species superficially resembles *B. mormo* Kirkaldy, but is separated very readily from that species by its much longer nasal process. It also might be confused with *B. suturalis* and *B. tenebrosa.*. For comparison with these species see notes under this heading in the descriptions of these species.

Male genitalia. Tenth abdominal segment extended into a short but pointed flap; the whole segment being about equal in length and width. The eleventh segment scarcely visible beyond the tenth and bearing a short, blunt stylus.

Each harpago as viewed from a flattened lateral view roughly crescent-shaped, its basal fourth prolonged into a slender fourth, the median region roughly rectangular, the apical fourth extended dorsad as a sharply pointed, slender hook which is as long as the median portion.

The bilaterally symmetrical aedeagal process is characteristic for the genus. The theca covers the aedeagus through the middle as a snugly fitting membranous sleeve narrowed at base and with its ventral median region extended caudad as two flat spatulate processes which bend dorsad, thus making them appear twice wider than

long. The sclerotized aedeagus is completely hidden except for a slender, sclerotized hook which extends between the lobes and collar of the aedeagus and bends directly ventrad.

Notes on distribution. Metcalf gives the type locality as Southern Pines, N. C. The writer studied a large series from Yorkstown, Hilliard, and Branford, Fla.

Bruchomorpha tenebrosa n. sp.

ORIGINAL DESCRIPTION*

Size. Length of female from apex of head to tip of abdomen 2.75 mm. to 2.95 mm. Width of abdomen, 1.3 mm. to 1.35 mm.

Color. Body shiny jet black, a dusky brown stripe beginning at a point just back of apex of frons widens gradually, then narrows abruptly at the vertex, continues as a narrow stripe across the vertex and pronotum and widens out again slightly on the mesonotum. No trace of this stripe on the tegmina. The median carinae of the frons, pronotum, and mesonotum show darker on this light stripe. Legs and underside all black, except the membranous region around attachment of hind coxae.

Structural details. This species has a medium-sized nasal process. From a dorsal view the head extends beyond the eye a distance approximately equal to length of eye. The median carina is distinct on frons, pronotum and mesonotum. Ventral margin of postclypeus slightly concave on posterior half, the anterior half somewhat outwardly expanded; its length as measured from anteclypeus to apex slightly greater than width of frontal process at a point in line with the joining of the lateral carinae of frons which in this species converge near apex of head. Tegmina proportionally shorter than in many species, veins prominent forming distinct cells and with less of the pebbled appearance which other species have. Dorsal line of body not arched as in *nodosa*.

Comparative notes. This species in size, form and the presence of black legs resembles *B. bunni, B. minima* and *B. suturalis* very closely. Of these four, *bunni* and *suturalis* are southwestern species and *minima* and *tenebrosa* southeastern. In color these forms can usually be distinguished by the extent of the median, dorsal light stripe, although since these stripes vary somewhat within the species, they cannot be relied upon too greatly in separating the species definitely. In general, *suturalis* has the stripe extending to the apex

* The writer is indebted to Mr. Ralph Bunn of the Bureau of Entomology for first recognizing this species as new, and who in preliminary manuscript, which he bequeathed to the writer, had given this name to the species.

of the abdomen, *bunni* has it extended on thorax and even across tegmina although here it is narrowed somewhat, *tenebrosa* has a wide, distinct yellow stripe extending from head to tip of mesonotum, but not onto the tegmina, and *minima* has a narrow yellow band only on the frons or sometimes, in addition, faintly on the pronotum.

In addition to color, *tenebrosa* is separated from *bunni* by having more rugose tegmina with distinct venation and the ventral margin of postclypeus much less concave than in that species.

From *minima* it is separated by its larger size, body less parallel-sided and frontal process not so narrowed.

From *suturalis* it is distinguished by not having the turned-up broad, frontal process, which *suturalis* has and by the more concave ventral margin of postclypeus.

Location of types. Described from three females. Holotype, collected by L. D. Tuthill, Loughman, Fla., August 2, 1930. Two paratypes, same place and collector. The types are in the Snow Entomological Collection at Lawrence.

Bruchomorpha tristis Stal, 1862

Stal, Carolus. Novae vel minus cognitae Homopterum formae et species. Berl. Ent. Zeit. VI, p. 309, 1862.

Metcalf, Z. P. The Fulgoridae of Eastern North America. Jour. Elisha Mitchell Soc. 38, pp. 139-230. 1923.

Dozier, Herbert. The Fulgoridae or Plant Hoppers of Mississippi. Miss. Agric. Exp. Sta. Bull. 14, pp. 3 to 149, 1928.

Ball, E. D. The Genus Bruchomorpha Newman (Homoptera-Fulgoridae). Bull. Brook. Ent. Soc. XXX, No. 5, pp. 197-203. 1935.

ORIGINAL DESCRIPTION

"Subcupreo-nigra, nitida; fronte clypeoque conjunctim parvum productis; venis tegminum distinctus. ♀—Long. 3½. Lat. 2 mm. Wisconsin. Dom. Rumbien. Mus. Holm."

AUTHOR'S DESCRIPTION

Size. Length of body from tip of head to apex of abdomen, 2.6 mm. to 3.5 mm.; width of body at broadest point, 1.6 mm. to 2 mm. Length of tegmen, 1.2 mm. to 1.36 mm. This is one of the largest species of the genus.

Color. General color uniform iridescent black. Occasionally specimens show a narrow bronze stripe following the median carina on frons and vertex. Also some specimens occasionally dark red-brown on head and thorax instead of black, and eyes gray. The entire body very shiny. Underside of body the same dark brown to

black color, except the less sclerotized areas around the large coxae of hind legs and the extreme apices of the leg segments.

Structural details. This is a short-nosed species. Length of frons in front of eye as viewed from above less than the length of the eye; its width through middle greater than in many species due to the fact that the frontal sutures which form the lateral boundaries of the frons are carried outward on a wide, sharp carina which from a side view shows as a distinct shelf over eye and gena; the two lateral carinae greatly arched through middle, very close together at base so that the distance between the two is equal to or even less than the distance from one carina to eye. Postclypeus very short, as viewed from the side equal in length to anteclypeus and only approximately one-half as long as the nasal process across its apex, its ventral margin evenly, outwardly rounded. Vertex very short, about eight times wider than long, deeply transversely convex, its anterior and posterior margins sharply elevated. Pronotum proportionally shorter than in other species, approximately four times wider than length through middle; a transverse depression indicated just posterior to cephalic margin and a distinct median carina present, on each side of which on the disk are located 17 or 18 conspicuous circular pits. Mesonotum prominent, not quite twice wider than long, the median carina distinct, two outwardly curving lateral carinae more elevated than it, the space between the lateral and median carinae distinctly concave, each lateral fourth covered by usually eleven circular pits. Tegmina reaching to about middle of abdomen, the longitudinal vein elevated and distinct, but their course difficult to trace because of the deeply rugulose or pebbled surface between them. Abdomen very globose, the anterior segments expanded somewhat beyond the lateral margins of the tegmina.

Male genitalia. Tenth abdominal segment (anal flap) with a short, tubular base, from which its posterior ventral region is expanded caudad into a rounded flap with parallel lateral margins. The ringlike eleventh segment is visible beyond the dorsal margin of the tube and bears an elongate stylus.

Each harpago as viewed from a flattened lateral view is somewhat crescent-shaped, broadest through base of apical third, and has its apical third greatly lengthened into a slender, pointed, recurved hook.

The aedeagal structure is distinctly different from other members of the genus. The aedeagus itself is a sclerotized structure, bearing at least one slenderly pointed hook near its apex, but the entire structure is practically hidden by the membranous theca which is a

tubular sheath somewhat narrowed at base, but which broadens caudad and finally ends in two, elongate, pointed flaps.

Comparative notes. This species is not easily confused with other species. It is distinguished by the iridescent black coloring of body and black legs, its greater width of body, very short nasal process and elevated veins in the tegmina.

Notes on distribution. Apparently a well-distributed species. Doctor Ball states, "The writer's material is all from northern and mountainous regions from Ontario and New York through Wisconsin, Iowa, Dakota, Colorado, Montana and Oregon, south in California to Dunsmuir and in Arizona to Oak Creek Canyon. The writer did not take it in Florida and has not taken it in Arizona below the yellow Pine Belt."

Dozier lists in addition to above-mentioned states New Jersey, North Carolina, Florida, and Texas.

The present writer had additional specimens from Kansas and Minnesota.

Bruchomorpha rugosa Metcalf, 1923

Metcalf, Z. P. The Fulgoridae of Eastern North America. Jr. Elisha Mitchell Soc., p. 185, 1923.

Ball, E. D. The Genus Bruchomorpha Newman (Homoptera-Fulgoridae). Bull. Brook. Ent. Soc. XXX, No. 5, pp. 197-203.

Comparative notes. This is a slender, light-colored species, resembling superficially an Aphelonema and having the most slender nasal process in the genus. Greatest width of body, 1.2 mm. to 1.8 mm.; length of body, 1.8 mm. to 3 mm. It is easily recognized by the light coloring of the body with touches of fuscous to light brown on head and thorax, the cells of the tegmina between the reticulation washed in varying degrees of fuscous and a series of elongate spots on each half of the abdominal segments which are dark brown and stand out in sharp contrast to the yellowish-tan background. The distinguishing structural characteristics are as follows: The vertex is narrower than in most species, being approximately only three times wider than long; each lateral third of its anterior margin is equal to and at an angle to the median third between the curved lateral frontal carinae and no median carina is present; the frontal process anterior to the eye is shorter than in many species, making it appear to be a short-nosed species, but the nasal process across apex is so slender that the postclypeus is three times longer than the width of this process; the lateral carinae of the mesonotum are sharper than in the majority of species and the disk between is conspicuously concave.

Male genitalia. Tenth abdominal segment (anal flap) with a short, tubular base, from which its posterior ventral region is expanded caudad into a very short, rounded flap. The eleventh segment is ringlike and scarcely visible beyond the 10th and bears an elongate stylus that extends beyond the margin of the flap.

Each harpago as viewed from a flattened lateral view is somewhat crescent-shaped, broadest through approximate middle, has its basal third in the form of a pointed arm and the apical third greatly lengthened and projected dorsad as a sharply pointed, slightly recurved hook.

The aedeagus is nearly all hidden by the semisclerotized theca, the latter fitting over the aedeagus as a tight sleeve and then extending caudad as two truncate flaps which bend dorsad, leaving a notch on each side from which protrudes a pointed well-sclerotized, ventrad-curving, aedeagal hook.

Notes on distribution. The type locality is Brownsville, Texas. Doctor Metcalf kindly loaned the writer a specimen for study taken at Nogales, Arizona. A long series of this species has been taken in the Santa Rita Mountains by Dr. R. H. Beamer, University of Kansas. Doctor Ball states that he has taken it on range grasses in several places in southern Arizona.

Bruchomorpha decorata Metcalf, 1923

Metcalf, Z. P. The Fulgoridae of Eastern North America. Jr. Elisha Mitchell Soc., p. 188. 1923.

Comparative notes. A medium-sized species varying in length from 2.25 mm. to 2.75 mm. As Metcalf states in the original description, it is easily recognized by "its very short nasal process, nearly vertical frons and strongly contrasted colors." As viewed from above, the head extends beyond the eyes only half the length of the latter and the lateral carinae of the frons are closer together at the base than the distance of one carina to each eye. The vertex is about four times wider than long. As viewed from the side the postclypeus is very short, equal in length to the anteclypeus and extending forward beyond latter a distance which is only about one-third width of nasal process across apex. The curved lateral carinae on mesonotum greatly elevated and very sharp.

Male genitalia. Tenth abdominal segment (anal flap) with a tubular base, from which its posterior ventral margin is expanded caudad into a truncate flap which is about the same length as the tube. The eleventh segment frequently not visible, bearing a pointed stylus.

Each harpago as viewed from a flattened lateral view is somewhat crescent-shaped, broadest through base of apical third, and has its apical third curved dorsad as a pointed process.

The aedeagal structure is similar to that of *B. tristis*. The aedeagus is a sclerotized tube entirely hidden by the theca, but bearing two sharply pointed, sclerotized hooks which protrude between the ends of the theca flaps. The theca is tubular at base, then caudad, expands into two elongate, ventral flaps whose apices point dorsad.

Notes on distribution. The type locality is given as Brownsville, Texas. Doctor Ball states that he has taken it also from the Baboquivari Mts. in Arizona and Cuernavaca, Mexico, and that he finds it strictly confined to a single species of grass, the Arizona foxtail (*Chaetochloa grisebachii*) as a food plant. The writer had a few specimens at hand from Laredo in addition to Brownsville, Texas, collected by Paul Oman.

Bruchomorpha mormo Kirk., 1907

Kirkaldy, G. W. Bull. Haw. S. P. A. Exp. Sta. IV, p. 64, 1907.

Dozier, Herbert. The Fulgoridae or Plant Hoppers of Mississippi. Miss. Agric. Exp. Sta. Bull. 14, pp. 3 to 149. 1923.

Ball, E. D. The Genus Bruchomorpha Newman (Homoptera-Fulgoridae). Bull. Brook. Ent. Soc. XXX, No. 5, pp. 197-203, 1935.

Comparative notes. This is one of the smallest species in the genus and black in color with yellow legs, washed in fuscous. The length of the body varies from 1.75 mm. to 2 mm. in length for specimens which the writer studied, although Kirkaldy states that it is 3 mm. long. In coloring it more closely resembles *B. tristis, B. minima, B. pallidipes* and *B. oculata.* From the latter it is easily separated by lacking any form of tan or rust median stripe on head and by its very short nasal process. From *B. tristis* it is easily separated by its much smaller size, its vertical head and its yellow and fuscous colored legs. From *B. minima* it is separated again by its short nasal process and yellow legs. For comparison with *B. pallidipes* see notes under that species.

In general the most distinctive characteristics of this species are: from above the head is produced less than half the length of eye, the nasal process is less prominent than in any other species so that the frons is more perpendicular and the frontal tablet is almost circular with the lateral carinae meeting well back of apex; from a side view the postclypeus is equal in length to the anteclypeus and also is about three-fourths of or not quite equal to width of nasal process across apex; the distance of the anterior margin of vertex between the lateral carina is slightly more than the distance from one carina

to the eye; median carina and the two lateral carinae of mesonotum distinct and equally raised; vertex very broad, at least six to seven times wider than long.

Male genitalia. The tenth abdominal segment with the tubular base parallel-sided and the flaplike extension of the ventral margin slightly longer and roundingly pointed. The stylus of the eleventh segment broader than in many species.

The harpago crescent-shaped, broadest through middle, with its basal fourth in the form of a slender, pointed process and its apical fourth sharply pointed and curved dorsad. The aedeagal structure is one of the most peculiar for the genus. The aedeagus is entirely covered by the theca except for a slender sclerotized hook which from a lateral view partially shows between the apical flaps of the theca. The theca is a collarlike tube which is broad at base, then tapers toward the apex, finally ending in two truncate, flat, lateral lobes.

Notes on distribution. The type locality is given as Nogales, Arizona. Doctor Ball states that this species is common in southern Arizona.

Bruchomorpha triunata Ball, 1935

Ball, E. D. The Genus Bruchomorpha Newman (Homoptera-Fulgoridae). Bull. Brook. Ent. Soc. 30: 197, 1935.

ORIGINAL DESCRIPTION

"A small, shiny black species resembling *tristis,* but with three broad stripes and a very narrow front, widest in the middle. Length, 1.6 mm.

"Front a long oval abruptly pointed below. Much narrower than in *mormo* and not top-shaped as in most species; the disc flat or concave, the bounding carinae light, the median one faint. Nasal process even shorter and broader than in *dorsata,* strongly carinate. Color black, a broad, white stripe from apex of front across the first exposed abdominal segment, as wide as frontal carinae at the vertex. A pair of oblique white stripes broadly covering the lower half of clypeus and gradually narrowing to beyond the middle of the elytra. A pair of white crescents arising under the lateral margin of the elytra and curving around to the genitalia. The pustules and legs pale.

"Holotype ♂, Patagonia, September 10, 1933. Paratype male and a female nymph, Nogales, July 13, 1934. Taken by writer sweeping range grasses."

Comparative notes. Not easily confused with any species in the genus because of its striped body and very short nasal process.

Male genitalia. Anal flap short, truncate across apex. Harpago more slender than in many species, broadest right at middle, from thence abruptly tapering basally into a pointed base, the posterior half narrowed and finally becoming an elongate slender dorsal-directed hook.

Aedeagus almost completely hidden by the theca. The thecal flaps unique in shape, each flap being boot-shaped and broadest across their dorsal region.

Notes on distribution. This is a rare species to date. Doctor Ball gives the type localities as Patagonia and Nogales, Arizona. Dr. R. H. Beamer collected a female in the Santa Rita Mts., August 17, 1932, and a male at Ruby, Arizona, August 22, 1938.

Bruchomorpha jocosa Stal, 1862

Stal, Carolus. Novae vel minus cognitae Homoptera formae et species. Berl. Ent. Zeit, VI, p. 310. 1862.

Metcalf, Z. P. The Fulgoridae of Eastern North America. Jr. Elisha Mitchell Soc. 38, pp. 139-230. 1923.

Dozier, Herbert. The Fulgoridae or Plant Hoppers of Mississippi. Miss. Agric. Exp. Sta. Bull. 14, pp. 3 to 149, 1928. Correct for female. Also = *B. bimaculata* (male of *jocosa*).

Ball, E. D. The Genus Bruchomorpha Newman (Homoptera-Fulgoridae). Bull. Brook. Ent. Soc. XXX, No. 5, pp. 197-203. 1935.

ORIGINAL DESCRIPTION

"Dilute flavo-testacea; basi clypei, tegminibus, parte commissurali excepta, appendicibusque genitalibus nigris; fronte clypeoque conjunctim parum productus. ♂ Long. 3, Lat. 1½ millim. Carolina meridionalis. Mus. Holm."

AUTHOR'S DESCRIPTION

Size. Length of body from tip of head to apex of abdomen, 1.8 mm. to 2.6 mm. Greatest width of body, .93 mm. to 1.3 mm. Length of tegmen, .8 to 1 mm. This is one of the smallest species in the genus.

Color. General color of female uniform reddish-yellow. Male reddish-yellow except the lateral two-thirds of each tegmen which is dark reddish-brown in sharp contrast to the general body color. Underside of body the same general reddish-tan color except for a sharply contrasting dark-brown spot on the median anterior two-thirds of postclypeus. Ovipositor of female sometimes washed in brown.

Structural characteristics. A short-nosed species. As viewed from above the head extends beyond anterior margin of eye only one-half the length of the eye. The frons is top-shaped with a dis-

tinct median carina present and prominent lateral carina which converges at base where they join the anterior margins of vertex so that the distance of the vertex margin between them is equal to distance from one carina to the eye. The frontal sutures are not as greatly elevated in front of antenna as in other species.

A nasal process is hardly discernible since as viewed from the side the postclypeus is not bulbous, has an almost straight ventral margin and in length is not much longer than the anteclypeus and is about equal to width of the nasal process across apex. Vertex characteristically broad and short, about six times wider than length. Pronotum with a median carina and the usual round pits on each lateral half. Mesonotum with a median and two lateral outwardly curving carinae present which are of about equal distinctness. Rest of thorax and abdomen barrel-shaped. Tegmina less pebbled than in the majority of species.

Male genitalia. The tenth abdominal segment tubular at base and with its ventral margin extended caudad as a roundingly pointed flap which is twice longer than the tube. The eleventh segment scarcely visible except for its stylus.

Harpagones more slender than in most species, typically crescent-shaped, with the broadest part at middle and at either end tapering to sharply pointed, slender processes.

The aedeagus is practically hidden by the theca which covers the aedeagus as a tubular sleeve and has its ventral posterior margin extended caudad as two spatulate processes.

Comparative notes. *B. jocosa* is readily distinguished from everything else in the genus by its short nasal process and the characteristic dark spot on apex of postclypeus.

Notes on distribution. Dozier records this from South Carolina, Florida, Kansas and Texas. Doctor Ball states that "this form is abundant throughout the Gulf region and is occasionally taken as far north as Virginia, Iowa and Nebraska."

KEY TO COLOR VARIETIES (Ball, 1935)

1. Females (and males) all dark or with only a trace of light stripes, var. *obscura* Ball, p. 131
   Females red or pale sometimes with a lateral dark stripe; males same. with the usual dark area on each tegmen 2
2. (1) Female all reddish or pale ..... var. *jocosa* Stal, p. 129
   Female reddish or pale with a lateral dark stripe ..... var. *craniata* Ball, p. 131

Bruchomorpha jocosa var. *craniata* Ball, 1935

Ball, E. D. The Genus Bruchomorpha Newman (Homoptera-Fulgoridae). Bull. Brook. Ent. Soc. XXX, No. 5, pp. 197-203. 1935.

ORIGINAL DESCRIPTION

Var. craniata Ball

"Resembling *jocosa* usually, but definitely larger and longer, with less of the 'barrel' shape. A broad, creamy, median stripe from tip to tip covering all the space between the lateral carinae on front and pronotum. Outside of this on either side a still broader pair of smoky or almost black stripes arising on the black 'nose' and usually omitting the margins of the abdomen. Legs and below reddish.

"Holotype ♀, allotype ♂, and seven paratypes, Onaga, Kan. (Crevec.); five paratypes, Stratton, Neb., and one each, Ames, Iowa, and Spring Green, Wis.; all except those from Kansas collected by the writer. This form might easily be confused with *vittata*, but the short nose will separate it."

Bruchomorpha jocosa var. *obscura* Ball, 1935

Ball, E. D. The Genus Bruchomorpha Newman (Homoptera-Fulgoridae). Bull. Brook. Ent. Soc. XXX, No. 5, pp. 197-203. 1935.

ORIGINAL DESCRIPTION

"Form and size of *jocosa*, almost uniformly dark, smoky or rusty brown, sometimes almost black with the legs and lower part reddish. The males often show a more or less definite dorsal light or reddish line.

"Holotype ♀, allotype ♂, and ten paratypes, Sanford, Fla., taken by the writer. This dark form is common in the winter period from Florida to Mississippi and has been taken as far north as New Jersey, D. C., and Virginia. It has, however, never before been recognized as a color phase of *jocosa*."

Bruchomorpha dorsata Fitch, 1856

Fitch, Asa. Trans. N. Y. St. Agric. Soc. XVI, p. 396. 1856.

Stal, Carolus. Novae vel minus cognitae Homopterum formae et species. Berl. Ent. Zeit. VI, p. 309. 1862. (As *flavo-vittata*).

Metcalf, Z. P. The Fulgoridae of Eastern North America. Jour. Elisha Mitchell Soc. 38, pp. 139-230. 1923. (His species is not *dorsata* Fitch but *extensa* Ball.)

Dozier, Herbert. The Fulgoridae or Plant Hoppers of Mississippi. Miss. Agric. Exp. Sta. Bull. 14, pp. 3 to 149, 1928.

Ball, E. D. The Genus Bruchomorpha Newman (Homoptera-Fulgoridae). Bull. Brook. Ent. Soc. XXX, No. 5, pp. 197-203. 1935.

ORIGINAL DESCRIPTION

"This is black and shining, with a pale yellow stripe along the middle of its back from the front to the tip, its legs being also pale

yellow with a dusky stripe on the thighs. Length, 0.16. Mr. Robertson has discovered individuals having the wing covers and wings fully developed, showing that it is a pupa which is described by Mr. Newman. As it may be as Mr. Westwood suggests in a letter to me, that these insects, like some of the Nepidae and other species belonging to this order, attain to puberty and perish without acquiring wings, whilst other individuals of the same species become fully developed."

Synonymy. The writer agrees with Doctor Ball that *flavo-vittata* Stal is a synonym of this species. Stal's original description of *flavo-vittata* is as follows:

"Nigra, subcupreo-nitens; vitta utrimque angustata, ab apice frontis ad apicem abdominalis ducta pedibusque dilute flavescentibus, hic fusco-vittatis; fronte clypeoque conjunctim nodice productis. ♂ ♀ Long. 3, Lat. 1½ millim. Wisconsin. Mus. Holm."

AUTHOR'S DESCRIPTION

Size. Length of body from tip of head to apex of abdomen, 2 mm. to 3 mm.; width, 1 mm. to 1.5 mm. Length of tegmen, .9 mm.

Color. Uniform dark shining species with a broad, yellow stripe down back. Frons, vertex and thorax a deep reddish-brown, with the median yellow band one-third the width of the vertex down to apex of mesonotum where it broadens a trifle. Tegmina and abdomen shining black with the yellow median stripe slightly broader throughout the length of tegmen, then becoming approximately same width as on frons and vertex and extending the full length of abdomen, including base of anal flap. Underside of body for the most part reddish-brown. Apex of postclypeus, all of anteclypeus and labrum, the beak, the less sclerotized areas around the coxal bases, and the caudal areas of the last few abdominal segments yellow to tan. Legs all yellow or with basal half of coxae and a lateral stripe on the tibiae fuscous.

Structural details. A short-nosed species. As viewed from above the frons extends beyond eye a distance less than the eye itself, a median carina distinct, two lateral carinae moderately, outwardly rounded, the distance between them at base about equal to the distance from one carina to each eye, the frontal sutures forming the lateral boundaries of the head and raised on a moderately sharp carina over each eye and gena. Postclypeus as viewed from the side very short, equal in length to anteclypeus, less than the width of the frontal process across apex. Vertex transversely con-

cave, about five times wider than length through middle. Mesonotum approximately three times wider than long, between the eyes roundingly produced forward over half the length of eye, its lateral cover from above almost completely overlapped by eye, then on extreme sides again expanded into a roundingly pointed flap which almost covers pleural region; the disk between mesal margin of eye and dorsal stripe covered with approximately sixteen round pits, a distinct median carina present. Mesonotum twice wider than long, a distinct median and two conspicuous lateral carinae present on each side of which in the disk are approximately eleven round pits. Tegmina approximately half the length of the abdomen with less rugulose appearance and less prominent longitudinal veins than in other species. Abdomen characteristically globose, showing five segments visible from above, on each side just back of anterior border a faint carina visible just back of which is a row of four round pits and one at extreme side.

Male genitalia. Tenth abdominal segment (anal flap) with a short tubular base, from which its posterior ventral region is expanded caudad into a pointed flap. The ringlike eleventh segment is only slightly visible and bears a moderately long stylus.

Each harpago is crescent-shaped, broadest through middle, its basal fourth forming a slender pointed arm and its apical fourth prolonged dorsad as a pointed process. The sclerotized aedeagus is covered through the middle by the tubular membranous theca which is somewhat narrowed at base and has its ventral posterior region projected caudad as two rounded spatulate lobes. Sclerotized aedeagal hooks are visible between the tubular part of the theca and the flaps.

Comparative notes. There are four species in the genus which are black with light cream, median longitudinal bands of considerable width. These are *B. dorsata, B. extensa, B. beameri* and *B. suturalis.* The latter two do not have the stripe extending across the abdomen to any extent. *Dorsata* is easily separated then, from *B. extensa* because of its very short nasal process.

Notes on distribution. Doctor Ball states that it is a northern species ranging from New York and North Carolina to Dakota and Kansas.

Dozier reports it from the following states: Arkansas, Colorado, Kansas, Iowa, Missouri, Ohio, North Carolina, New Jersey, New York, Texas, and Wisconsin.

Bruchomorpha pallidipes Stal, 1862

Stal, Carolus. Novae vel minus cognitae Homopterum formae et species. Berl. Ent. Zeit. VI, p. 309. 1862.

Metcalf, Z. P. The Fulgoridae of Eastern North America. Jour. Elisha Mitchell Soc. 38, pp. 139-230. 1923.

Dozier, Herbert. The Fulgoridae or Plant Hoppers of Mississippi. Miss. Agric. Exp. Sta. Bull. 14, pp. 3 to 149. 1928.

Ball, E. D. The Genus Bruchomorpha Newman (Homoptera-Fulgoridae). Bull. Brook. Ent. Soc. XXX, No. 5, pp. 197-203. 1935.

ORIGINAL DESCRIPTION

Nigra; vitta media frontis, thoracis scutellique, margine commissurali nec non pedibus flavo-testacis; fronte clypeoque conjunctim medice productis. ♀ Long. 3, Lat. 1½ millim. Carolina meridionalis. Dom. Belfrage. Mus. Holm.

AUTHOR'S DESCRIPTION

Size. Length of body from tip of head to apex of abdomen, 2.2 mm. to 2.6 mm.; width, 1.1 mm. to 1.36 mm. Length of tegmen, 1.06 mm. to 1.1 mm.

Color. General color resembling *oculata* and *nasuta.* Head and thorax from above a rich brown to blackish, but usually a lighter shade than tegmina and abdomen. A median testaceous yellow to bronze median longitudinal band on frons, vertex and pronotum, which in width is about one-fifth the width of vertex. On mesonotum and claval margins of tegmina this broadens somewhat and at sides indistinguishably blends into the darker coloring of the sides. Eyes dark brown, margined in light and frequently spotted with light. Tegmina and abdomen deep brown to pitch, usually quite shining. Underside of body shining dark brown to black except the less sclerotized areas of the thorax. Legs usually testaceous yellow with the coxae and sometimes the bases of other segments somewhat darker, or sometimes legs are all fuscous except at apices of the segments.

Structural characteristics. A short-nosed species. Frons, as viewed from above, extending beyond eye a distance slightly less than length of eye, its lateral carinae at base placed closer to median carina so that the distance between the two lateral carinae is equal to the distance from one carina to the median margin of eye, united just before apex; frontal suture elevated in a sharp carina which hangs shelflike over the gena on which is situated the antenna; ventral margin of postclypeus only slightly convex, its length at this point approximately equal to width of nasal process across its apex. Vertex approximately six times wider than long, transversely concave and a faint median carina present. Pronotum characteristic

of the genus in shape, with a distinct median carina and about 18 or 19 pits on each lateral dorsal disk; its extreme lateral third extended around and under eye as a short collar, not visible from above, but which again broadens at the side into a pointed ventrad projecting flap, bearing four round pits just cephalad of its posterior margin. Mesonotum not as long as in some species, approximately twice wider than long; a distinct and sharp median carina present; two lateral carinae only faintly indicated, if at all. Tegmina extending to slightly over half length of abdomen, longitudinal veins indistinct, their entire surface more pebbled than in other species. Abdomen barrel-shaped, with five segments visible, lateral carinae present on anterior margin of each segment just back of which are single rows of four to five round pits.

Male genitalia. Tenth abdominal segment (anal flap) with a short tubular base, from which its posterior ventral region is extended caudad as a bluntly pointed flap. The ringlike eleventh segment shows beyond the dorsal margin of the tube and bears a blunt, fingerlike stylus.

Each harpago, as viewed from a flattened lateral view, is somewhat crescent-shaped, broadest at apex of basal third and has its apical third greatly lengthened into a slender, sharply pointed, dorsad curving hook.

The aedeagal structure is bilaterally symmetrical. The sclerotized aedeagus is covered through middle by the tubular membranous theca which is somewhat narrowed through middle and has its ventral posterior region projected caudad as two rounded spatulate lobes. Sclerotized aedeagal hooks are visible between the tubular part of the theca and the flaps.

Comparative notes. Size and form of *B. minima* and *B. mormo*. Also resembles *B. suturalis* and *B. oculata*. From both *B. suturalis* and *B. minima* it is separated by its extremely short nasal process and yellow legs. From *B. oculata* it is separated by its smaller size and short nasal process. From *B. mormo* it is separated by having an indication of a dorsal median stripe on head and thorax, a shorter postclypeus, an elongate top-shaped frontal tablet instead of the circular one as in that species.

Notes on distribution. Dozier states that this species is recorded from Virginia, South Carolina, Florida, Kansas, Colorado, and adds Mississippi. In addition to these states the writer studied specimens from Alabama, Louisiana, and a large series from Washington, D. C.

THE GENUS DANEPTERYX

Uhler, P. R. New Genera and Species of American Homoptera. Trans. Maryland Acad. Sci. I, p. 42, 1889.

Melichar, Leopold. Monographie der Issiden (Homoptera). Abh. k. k. Zool. Bot. Ges. Wien, III, pt. 4, 1906.

Kirkaldy, G. W. A Brief Note on Three (Two New), Californian Fulgorid Hemiptera. Proc. Haw. Ent. Soc. II, p. 23, 1908.

Van Duzee, E. P. A Preliminary List of the Hemiptera of San Diego county, California. Trans. of San Diego Soc. of Nat. Sci. 2 (1), p. 42, 1914.

Comparative notes. This genus is recognized by having narrow, strap-shaped wing covers, somewhat triangularly widened at base and tapering at tip, where they become acutely rounded; contracted angulate head with an oblong quadrangular vertex having acutely prominent angles; front oblong, with sides and middle line prominently carinate; pronotum transverse, short, depressed on the disk, the anterior angle subacute, with the sides narrow and curved downward; scutellum triangular, carinate, acute at tip; wings rudimentary; hind tibiae with four laterally placed spines; abdomen obese, carinated above.

HISTORY OF THE GENUS

The genus was described by P. R. Uhler in 1889 with *manca* as the haplotype. In 1906 Melichar added an additional species, *lurida*. Kirkaldy in 1908, with no reference to *lurida*, described two new species, *barbarae* and *artemesiae*, which he compared to *manca* only.

Since Kirkaldy states that the tegmina vary in length in *barbarae*, also, Van Duzee, in collecting *manca*, states that this species varies from a fulvous brown to dark fuscous with sometimes a dorsal stripe and the elytra whitish or grey, and since on outward appearance the present writer as well as coworkers have found them to be difficult to separate, it makes the status of the named species somewhat dubious. Moreover, the types of none of the three latter species have been available for study. Yet by means of the male genitalia and certain minute, yet distinct external characters, the writer believes that these four species can be differentiated, with perhaps *lurida* remaining as the most doubtful.

To the four named species are being added two new species, *D. adiuncta* and *D. robusta*. These are sufficiently different in shape of tegmina and genitalia from the older species involved to warrant describing them as new.

KEY TO SPECIES

1. Tegmina wider, not more than five times longer than greatest width, greatly widened through basal third so that claval margins touch or are almost adjacent 2

   Tegmina narrow, distinctly straplike, over five times longer than greatest width, not greatly widened at base; claval margins not approaching each other.. 3

2. (1) Short, stout-bodied; costal margin of tegmina almost straight, reticulation much less pronounced, only one conspicuous median longitudinal vein, *robusta* n. sp., p. 143
   Larger insects; basal third of costal margin greatly expanded, the tegmen at this point almost twice wider than at apical third, reticulation coarse, *adiuncta* n. sp., p. 141
3. (1) Frons wider, outer margins outwardly curved, greatest length at sides about twice median length of postclypeus, dorsal margin concave, at the point not greatly narrowed; larger, 5-5½ mm. long..... *barbarae* Kirk., p. 140
   Frons more wedge-shaped, considerably narrowed dorsad, one lateral margin over twice the length of postclypeus at middle..... 4
4. (3) Tegmina with one prominent middle vein, cells posterior to this smaller, forming a finer reticulation ..... *artemesiae* Kirk., p. 139
   Tegmina with longitudinal veins and crossveins all coarse, greatly elevated above the cells 5
5. (4) Dorsal margin of frons deeply notched; very dark body coloring, *lurida* Mel., p. 138
   Dorsal margin of frons almost straight; light tan, mottled with dark, *manca* Uhl., p. 137

Danepteryx manca Uhler, 1889

(Plate XVIII, Figures 6, 11, 16)

Uhler, P. R. New Genera and Species of American Homoptera. Trans. Maryland Acad. Sci. I, p. 42, 1889.

Van Duzee, E. P. A Preliminary List of the Hemiptera of San Diego county, California. Trans. of San Diego Soc. of Nat. Sci. 2 (1), p. 42, 1914.

ORIGINAL DESCRIPTION

"Grayish fuscous, pubescent, tinged with white, pale yellowish-brown when immature. Upper surface and wing covers scabrous. Head rough, a little hairy, the carinate lines blackish, interrupted with white; lower part of cheeks and epistoma pale testaceous. Legs and tarsi spotted with fuscous. Pronotum a little pale about the margins. Pectus hairy, unevenly fuscous, marked with a white spot above the orifice of the mesothoracic spiracle. Underside chiefly paler than above, sometimes testaceous, or white on the posterior coxae. Wingcovers ashen gray, with chiefly black veins, the veins of the costal and inner border coarsely interrupted with white, while those of the discal portion are minutely speckled with white. Anal and genital segments more or less rusty yellow. Length to tip of wing covers, 4½ to 5 mm.; to end of venter, 3½ to 4½ mm.; width of pronotum, 1¾ to 2 mm. This insect has thus far been reported only from Los Angeles, Cal., from which place several specimens have been referred to me for examination by Mr. D. W. Coquillet.

"It is the most remarkable insect of the order which has yet been discovered in North America. The wing covers lack the membranal area which is so often present in the insects of this group, while the form of these organs and their type of venation lead to the Orthoptera of the group Acrididae, and thus give us an ancestral

type which might well be a remnant of the old Fauna prevalent in the Rocky Mountain region during the Tertiary period."

Comparative notes. This species is not readily separated from *D. barbarae* Kirk., *D. artemesiae* Kirk., or *D. lurida* Mel. By close comparison it is separated by the following characteristics: Pronotum and vertex through middle of equal length, vertex more tapering anteriorly, the rounded anterior margin of pronotum distinctly wider than vertex at base, dorsal and ventral margins of frons not noticeably different in width, the former being only one-fourth greater; cells of the tegmina more evenly rectangular than in other species; tegmina narrow, but usually not much longer than tip of abdomen.

Male genitalia. Anal flap moderately emarginate at apex. Each harpago, as seen from a flattened lateral view, has its ventral margin outwardly rounded and its dorsoapical angle extended cephalad as a sharply pointed projection at base of which is an abbreviated, sharp mesal spine and on the outside a recurved hook.

The aedeagus is tubular with its extreme apex somewhat flattened, then narrowing into a blunt point. The tubular theca covers the approximate basal fifth. Attached near the base of the aedeagus and projecting beyond the posterior margin of the theca are two, thick, slightly curved hooks which are shorter than those in other species, while a second larger pair arise just caudad of middle, one on either side, whose apices are sharply pointed and project cephalad.

Distributional notes. Described from Los Angeles, Cal. Van Duzee (1914) states that it is "abundant everywhere on *Adenostoma* and *Artemiscia* and comes to maturity about April 1, but specimens may be occasionally found throughout the autumn and winter."

Specimens are at hand for study from the following places in California: Alameda county, Claremont, Del Mar, Lempoc, Monterey, Mt. Diablo, Newton, Nipomo, San Diego, Santa Cruz Mt., Stimson Beach and Ventura.

Danepteryx lurida Mel.

(Plate XVIII, figs. 2, 9, 10)

Melichar, Leopold. Monographie der Issiden (Homoptera). Abh. k. k. Zool. Bot. Ges. Wien III, 1906.

ORIGINAL DESCRIPTION

"Von der vorhergehenden Art durch die kleinere Gestalt und die stark dunkle, äusserst dickt schwarz gesprenkelte Färbung des Körpers unterschieden. Der Aberrand des Stirne ist stärker winkelig

ausgeschnitten. Das Basalsegment des Bauches ist blassgelblich, mit zwei Längsfurchen versehen, zwischen denselben und an den Seiten Gruppen von schwarzen Punkten, die Beine sehr dicht und fein schwarz gesprenkelt, ein schwarzer Ring vor der Spitze der Schenkel. ♂ ♀ Länge, 3½-4 mm.

"Nordamerika, Claremont, Cal. Zwei Exemplare von Baker in meiner Sammlung."

Comparative notes. This species is very difficult to separate from *D. manca.* This brings out two problems. Since the type cannot be located, it is not at all certain that the author has recognized the proper form as *lurida,* and, secondly, if the forms classified as *lurida* in this paper are correctly named, it still might be debatable as a valid species since the characters for separation are not very obvious.

It differs from *manca* by having the dorsal margin of the frons deeply angled instead of being truncate as in *manca,* by having the lateral margins of frons straighter and converging at base, by having the tegmina slightly wider at base than in *manca* with the longitudinal veins beyond middle converging at various points, making the apical half more reticulated and not such uniform rectangular cells present as in *manca.* The aedeagus is quite distinct from *manca,* as can be seen in the drawings.

Male genitalia. The anal flap of this species seems to be more deeply emarginate than in *artemesiae.* The harpago, as viewed in flattened lateral view, has the posterior, ventral margin angulate, while in other species it is rounded at this point.

The aedeagus differs from other species in the genus, mainly by having the left hook of the posterior pair angulately bent, forming a boot-shaped structure, whose apex is directed caudad. The basal hooks of the theca are longer than in *manca* and less curved, extending at least to apex of basal third of theca.

Notes on distribution. Claremont, California, is given as the type locality. The series of specimens studied for this paper are from San Jacinto Mts., Stimson Beach, San Francisco, and Montara, California.

Danepteryx artemesiae Kirk. 1908

Kirkaldy, G. W. A Brief Note on Three (Two New), Californian Fulgorid Hemiptera. Proc. Haw. Ent. Soc. II, p. 23, 1908.

ORIGINAL DESCRIPTION

"Smaller and much darker than the last, but the head structure is very similar; the frons is narrower, though at the same time it is distinctly wider than in *D. manca.* The general ground color is dark fuscous, the legs more heavily and darkly sprinkled than in

D. barbarae. Antennae dark fuscous. Tegmina piceous or blackish (instead of yellowish-brown), with paler markings. The tegmina are narrower and the pronotum is shorter than in *D. barbarae*, more so even than in *D. manca.* Length, ♀ 4½ mm.

"Hab. California, Alameda (Perkins) on Artemesia."

Comparative notes. This species is very similar to *D. manca* and *D. lurida.* It differs from *manca* mainly by the longer pronotum, which is approximately twice the length of the vertex, while in *manca* the two are the same length; the frons narrowed considerably at dorsal margin, at this point being half again as wide as at ventral area; the tegmina has usually a prominent middle vein from which it seems the others tend to branch off rather than the parallel longitudinal veins of *manca.*

From *lurida* it is separated by not having the basal margin of the frons angled as in *lurida* and again by the prominent middle vein of the tegmen.

Male genitalia. The anal flap of this species seems to be more truncate at apex than in *manca* or *lurida,* with its lateral margins parallel. The harpago is larger with its apical fourth narrowing into an elongate, dorsal recurved arm.

The aedeagal structure is distinct. The theca itself is proportionally longer. The distal portion of the aedeagus is broadened considerably, much curled under the shaft part and finally ends in a sharp, recurved spine. The basal hooks of the aedeagus are much longer than in any other species, reaching at least to middle. The posterior lateral hooks are greatly reduced to mere prongs.

Geographical distribution. Described from Alameda, California. Specimens were on hand for study from the following places in California: Cajon, Del Mar, Lompoc, Mint Canyon, Nipomo, Topango Canyon, and Ventura.

Danepteryx barbarae Kirk, 1908

Kirkaldy, G. W. A Brief Note on Three (Two New), Californian Fulgorid Hemiptera. Proc. Haw. Ent. Soc. II, p. 23, 1908.

ORIGINAL DESCRIPTION

"This is close to *D. manca* Uhler, but differs by the basally truncate frons, which is also much wider in proportion, widening towards the apex. The vertex is shorter and wider, the lateral margins parallel (converging very slightly anteriorwards, if anything), the anterior margin very obtuse-angled. The pronotum is rather more produced anteriorly, its lateral margins more arched. Antennae yellowish-testaceous. The tegmina vary in length.

"Length, ♀ 5½ mill.

"Hab., Cal., Santa Barbara foothills, July (Gifford)."

Comparative notes. This species seems to be a slightly larger species with longer tegmina than the other species in the genus. It is separated from other species externally by having a broad frons, with lateral margins outwardly curving, across ventral area being only one-sixth wider than at dorsal margin; by having long pronotum, being one and one-half times longer than vertex through middle; by having a wide vertex, with its anterior margin one-third wider than one lateral margin; wing venation forming an uneven network.

Male genitalia. Harpago as viewed from a flattened lateral view, crescent-shaped, larger than in other species and with the dorsoapical corner projecting dorsad as a sharply pointed projection, at base of which is the usual recurved spine, which in this species is more fingerlike and longer than it is in the closely related species.

The aedeagus is distinctly different. The theca is proportionally longer, with the ventrad portion longer than the ventral. The basal hooks of the theca broad across the base, sharply narrowing to the pointed apex, which is about at middle. The two lateral hooks are more reduced than in *artemesiae,* being reduced to mere pointed extensions of the lateral margins.

Distributional notes. The type locality is given as Santa Barbara, California. Specimens were on hand for study from the San Jacinto Mountains, California.

Danepteryx adiuncta n. sp.

ORIGINAL DESCRIPTION

Size. Length of body from tip of head to apex of tegmen, 3.5 to 3.7 mm.; greatest width of body, 1.5 mm. to 1.75 mm.

This is a robust species with broader, shorter tegmina than in the older species, but not quite as short stature as in *robusta* n. sp.

Color. Characteristically mottled as are all the members of the genus. General body color from above reddish-brown mottled with tan, carinae yellow or light tan, extreme carinate edges of vertex and pronotum dark brown followed immediately by a thin border of light tan. Eyes mottled dark brown. Segments of abdomen shaded with dark on posterior margins. Underside of body lighter, mottled with dark. Legs light tan with irregular splashes of brown, spines on tibiae and tarsi dark brown to black. Tegmina with dark-brown background, veins light yellow and margin all around bordered with uniform roundish light yellow spots.

Structure. Vertex broad, one lateral margin and anterior margin twice the length at middle from apex to occipital declivity. Frons broad, margins distinctly outwardly bowed, greatest width at base of ventral third, at this point approximately one-fourth wider than across dorsal margin. Pronotum typical, with the arched central region with the sharply defined carinae extending forward into head region only half the distance of the eyes. Mesonotum with sharply elevated carinae. Abdominal segments carinated at middle. Tegmina short, through basal third almost twice wider than apical third, the claval region short, with inner margins almost touching, the basal third of costal margin greatly expanded, then suddenly constricted at middle from which point it gently curves to the rounded apex. Tegmina with one prominent longitudinal vein at middle, the rest of veins forming an irregular network, all veins conspicuous and greatly elevated.

Male genitalia. Anal flap short, parallel-sided, the apical margin deeply, roundingly emarginate. Eleventh abdominal segment showing as a broad, short, ringlike segment, the stylus moderately long.

The harpago, as viewed from flattened lateral view, has its ventral and apical margin greatly rounded, the apical dorsal extension is moderately long, sharply pointed and bears at its base on the outside a medium sized, recurved external hook.

The aedeagus is a semicircular tube which is concave ventrad and at apex ends as a truncate flap. Attached near its base and projecting slightly beyond the posterior margin of the theca are two slender, curved hooks. Just posterior to the apex is another pair of small hooks whose apices are directed cephalo-dorsad. These hooks are placed much nearer the apex than in other species. The theca is more abbreviated in this species than in the others.

Comparative notes. This species is easily distinguished from the other older species by the broadened tegmina which have their claval margins adjacent. It is more similar to *D. robusta* n. sp. because of this condition, but is separated from this species because the apical half of the tegmen is greatly narrowed again and by having a coarser reticulation and less pronounced median longitudinal vein.

Location of types and distribution. Holotype male, collected by R. I. Sailer, at Monterey, Cal., August 10, 1938; holotype female, same place and collector. Four paratypes, same data.

Danepteryx robusta n. sp.

ORIGINAL DESCRIPTION

Size. Small, robust species; length of body from tip of head to apex of tegmen, 3 to 3.5 mm.; width of body through thorax, 1.4 mm.

Color. Color tan, general color lighter than in other species. Vertex and pronotum yellowish-tan with outer carinate margins brown. Eyes reddish-brown mottled with dark. Pronotum tan with carinae light yellow. Frons and postclypeus mottled with minute irregular splashes of reddish-brown, the thin carinate edges dark brown. Thorax yellowish-tan. Legs yellow splashed with irregular specks of dark brown, tips of tibial spines, claws, and last segment of tarsi dark brown. Thorax yellow. Abdomen yellow, with some of the segments at the sides and towards posterior margins darker, the disks of first abdominal segments dotted with round brown spots. Tegmina mostly yellowish-tan, dimly mottled lengthwise through middle with fuscous, the veins standing out distinctly yellow against this darker background.

Structure. Vertex broad, anterior margin and lateral margin equal, almost twice the length at middle from apex to occipital declivity. Frons narrow as in *manca,* being about one-third wider through ventral third than across dorsal margin which is truncate or only very slightly angulate. Pronotum short, length through middle not more than one-third longer than median length of vertex. Mesonotum with three sharp carinae. Tegmina short, broad, with claval margins adjacent, rest of inner margins almost touching due to the fact that the costal margins and entire inner margins are parallel and that the base of the wing is not expanded as in *adiuncta.* Wing venation similar to that of *artemesiae* with a prominent middle vein, posterior to which the cells are small and the veins are not greatly elevated.

Male genitalia. Anal flap (tenth abdominal segment) long, with the ventral region extended into a deeply, roundingly notched flap which is about again as long as the tube itself. The ringlike eleventh segment conspicuous with an exceptionally long fingerlike flap.

The harpago small, having no greatly extended apical dorsal hook and a short external hook just anterior to apex.

The aedeagus is a semicircular tube which is concave on the ventral side and at apex bluntly pointed. Attached somewhere near the base of the aedeagus and projecting beyond the posterior margin of the theca are two thick, slightly curved pointed hooks, which are sickle-shaped and of median length. A second pair of aedeagal

hooks arises just caudad of middle whose sharp-pointed apices are directed cephalad. The sleevelike theca covers the approximate basal third.

Color phase. A few specimens, taken at the same time and place as the typical form show a variation in color by having the fuscous markings much more pronounced, thus, in general, being much darker in coloring.

Comparative notes. This species resembles more closely *D. adiuncta* and *D. artemesiae.* Like *artemesiae* it has the prominent median longitudinal vein beyond which the cells are small due to finer reticulation. It differs from this species by having the shorter, broader tegmina which adjoin along claval and inner margins. It is similar to *adiuncta* by the adjoining of the tegmina, but differs from this species by having the costal and claval margins parallel and the basal region of the tegmen not expanded as in *adiuncta.* Also, *adiuncta* does not have the pronounced middle vein with the cells posterior to it small and the veins fine, but all veins are coarse.

Location of types and geographical distribution. Holotype male and allotype female from Ventura, Cal., collected by R. H. Beamer, July 20, 1933. A series of forty males and thirty-eight female paratypes, same data. Four males and four female paratypes from Gaviota, Cal., collected by R. H. Beamer, July 19, 1933. One male and nine female paratypes taken at Palm Beach, Cal., July 27, 1938. Eight males and six females taken at Palm City, Cal., July 27, 1938, by R. H. Beamer. Types are in Snow Entomological Collection at the University of Kansas.

THE GENUS TYLANIRA Ball, 1936

Ball, E. D. Some New Issidae with Notes on Others (Homoptera-Fulgoridae). Proc. Biol. Soc. Wash. 49: 155-158, 1936.

The writer has not seen specimens of the species described by Doctor Ball for this genus. For this reason the original description only of the genus and the species *bifurca* is given in this paper.

ORIGINAL DESCRIPTION OF THE GENUS

"Resembling *Tylana* Stal (as represented by *ustulata* Uhl.) and *Ulixes* Stal in general form and structure, but with a much narrower and more acutely angled head which is produced into two long, divergent processes extending obliquely forward and upwards, two and one-half times the length of the eye. Superficially resembling *Lusanda* Stal from Ceylon, but in that genus the head is broad, and the projections point obliquely downwards. Vertex one and one-half

times as long as its basal width, nearly that much longer than the pronotum, the disc with a deep angular trough, the two projections triangular in shape, inclined upward, the angle between them acute and extending down to expose the carina of the front. Pronotum and mesonotum as in *Tylana* except that there are three large tubercles in the lateral compartments on each side of the latter. Elytra longer and more definitely angled behind with a longer inflated bulla than in *Tylana*. Venation reticulate and similar to that in *T. ustulata*. Front one-half longer and no wider than in *Tylana*, 5-carinate, the intermediate carina rounding in above and not extending onto the projections. The whole insect clothed with long stiff bristles.

"Type of the genus *T. bifurca*, n. sp."

Tylanira bifurca, Ball

"Form of the genus, resembling *Tylana ustulata* Uhl., larger with a much longer, narrower head and pronotum giving the insect a wedge-shaped appearance anteriorly and a blunt wedge posteriorly. Length, ♀ 8 mm., or ♂ 7 mm.

"General color lighter brown than in *ustulata* with a definite grayish cast, the cinnamon chevrons of *ustulata* reduced to pale ovals while there are two smaller spots behind connected by a broken line. Holotype ♀, allotype ♂, and a pair of paratypes, Benson, Ariz., June 7, 1930, and one female, Fort Hancock, Texas, June 9, 1930. All taken by J. O. Martin and received through the kindness of E. P. Van Duzee of the California Academy of Sciences. Types in that museum, a paratype ♀ in the author's collection.

"This is the largest and most striking Issid yet recorded from the United States."

THE GENUS PAPAGONA BALL, 1935

Ball, E. D. Some New Issidae with Notes of Others. Bull. Brook. Ent. Soc. 30:40. 1935.

ORIGINAL DESCRIPTION OF THE GENUS

"Allied to *Aphelonema*, but much more elongate in form, with the vertex as long as wide, the eyes enclosing only about half the pronotum and the front triangular, broadest below.

"Vertex flat, long and narrow, longer than pronotum, equaling the mesonotum, as long as its basal width. Head with the eyes definitely narrower than the pronotum which is constricted on the anterior half and enclosed by the eyes and then widened and laterally carinate posteriorly, but again exceeded in width by the elytra and abdomen. (In *Aphelonema* the insect is barrel-shaped, the head almost as wide

as the body.) Pronotum extremely long and narrow, almost as long as wide, the lateral margins carinate and broadly pustulate, mesonotum elongate, the lateral carinae extremely high and enclosing a tablet that is much longer than wide. Elytra brachypterous, covering over one-half the abdomen, the sutural line depressed in middle, the posterior margin rounding with an inflated area in front on either side. Venation as in *Aphelonema*. Hind tibiae with a single stout spine. Face elongate, retreating, forming a 30° angle with vertex. Front the shape of a rather long flatiron. Truncate with two pustules below. The lateral pustulate areas extremely wide above.

"Type of genus: *Papagona papoosa* n. sp.

Comparative notes. The present writer has not seen the type species of the genus. Doctor Ball very kindly donated a paratype of *P. succinea*. This species shows all the differences between this genus and Aphelonema, as pointed out in the original description given above.

KEY TO SPECIES

1. Vertex short, flat, mesonotum depressed, amber colored without median stripe, *P. succinea* Ball, p. 147
2. Vertex long, concave, mesonotum flat, gray and brown in color with a broad median, white stripe ..... *P. papoosa* Ball, p. 146

ORIGINAL DESCRIPTION

"A gray and brown species with a long vertex, a broad median white stripe and three pairs of white spots. Length: ♂, 2.6 mm.

"Vertex long, tapering, deeply concave, the postocular carina of the pronotal flaps rounding, only a little higher than the carinate lower margin. Mesonotum with the median portion flat. Front much longer than its apical width. The lateral margins of the pustulate areas very weakly carinate.

"Color, pale straw, a broad median white stripe to the apex of the mesonotum narrowing posteriorly. The outer inflated portion of elytra and the median inflated portion of abdomen piceous, a pair of round, waxy spots back of the hinge on the elytra, a smaller pair in the saddle, a large pair on outer portion of the first exposed segment and often three approximate dots along the median line. Below and legs dark brown, shading out to straw on the front. The coxae and venter pale blue.

"Holotype ♂, taken from bluffs of the Santa Cruz river near Tubac, Ariz., August, 1932. Paratype ♂ in the same spot, May, 1932. Both swept by the author from a clump of joint grass (*Mahlenbergii porteri*)."

Papagona succinea Ball, 1935

(Plate XV, figs. 2, 2a, 2b)

Comparative notes. Doctor Ball states that this species is separated from *papoosa* by the following differences: By having a shorter head and vertex definitely shorter with apex more bluntly rounding and the disc almost flat with the marginal carinae raised instead of disc being deeply concave as in *papoosa;* by having the frontal tablet definitely broader and more rapidly narrowing than in *papoosa;* by having a depressed mesonotum, and by being a rich amber color without the median stripe.

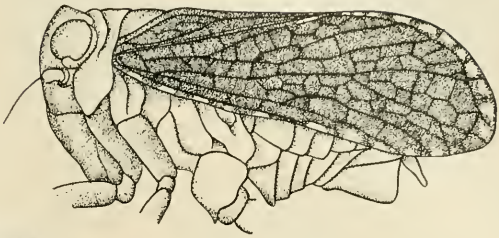
Notes on distribution and location of types. The types were collected by Doctor Ball in the Tucson Mountains, Arizona, and Sabino Canyon of the Santa Catalina Mountains in April on small clump grass, *Triodia mutica* Benth.

PLATE XIII

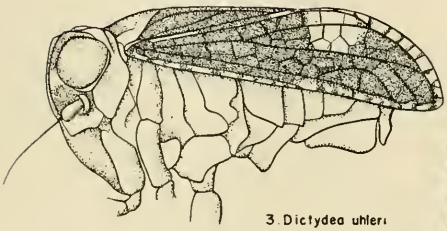
1. Dorsal view of head and thorax of *Dictydea nigrata* n. sp.
2. Lateral view of *Dictydea nigrata* n. sp.
3. Lateral view *Dictydea uhleri* n. sp.
4. Lateral view of *Dictydea intermedia* Uhler.
5. Dorsal view of head and thorax of *Dictydea uhleri.*
6. Lateral view of *Dictydea angustata* Uhler.
7. Dorsal view of *Dictydea intermedia* Uhler.
8. Dorsal view of head and thorax of *Dictydea valida* n. sp.
9. Dorsal view of *Dictydea angustata* Uhler.
10. Lateral view of *Dictydea valida* n. sp.

PLATE XIII

1 Dictydea nigrata



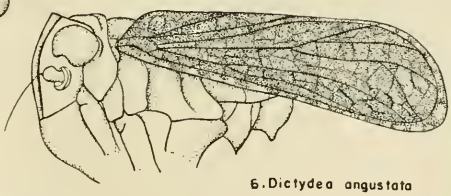
2. Dictydea nigrata



3. Dictydea uhleri

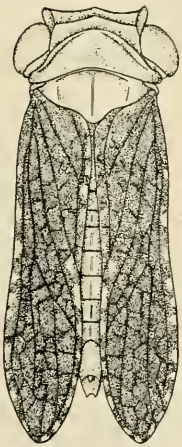
4 Dictydea intermedia

5. Dictydea uhleri



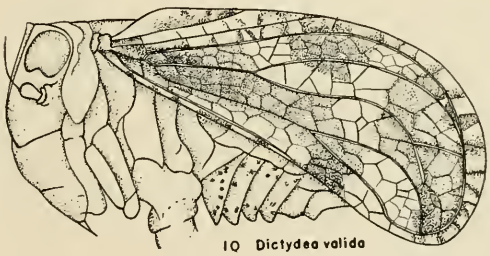
6. Dictydea angustata

7. Dictydea Intermedia



9. Dictydea angustata

8. Dictydea valida



10 Dictydea valida

PLATE XIV

1. Cephalic aspect of head of *Dictydca angustata* Uhler.
2. Cephalic aspect of head of *Dictydca intermedia* Uhler.
3. Cephalic aspect of head of *Dictydca valida* n. sp.
4. Cephalic aspect of head of *Dictydca nigrata* n. sp.
5. Cephalic aspect of head of *Dictydca uhleri* n. sp.
6. Cephalic aspect of head of *Dictydca intermedia* Uhler.
7. Lateral view of harpago of *Dictydca angustata* Uhler.
8. Anal flap of *Dictydca intermedia* Uhler.
9. Lateral view of aedeagus and theca of *Dictydca angustata* Uhler.
10. Anal flap of *Dictydca angustata* Uhler.
11. Lateral view of aedeagus and theca of *Dictydca intermedia* Uhler.
12. Lateral view of harpago of *Dictydca nigrata* n. sp.
13. Anal flap of *Dictydca nigrata* n. sp.
14. Anal flap of *Dictydca valida* n. sp.
15. Lateral view of *Dictydca valida* n. sp.
16. Lateral view of harpago of *Dictydca valida* n. sp.
17. Lateral view of aedeagus and theca of *Dictydca nigrata* n. sp.

PLATE XIV

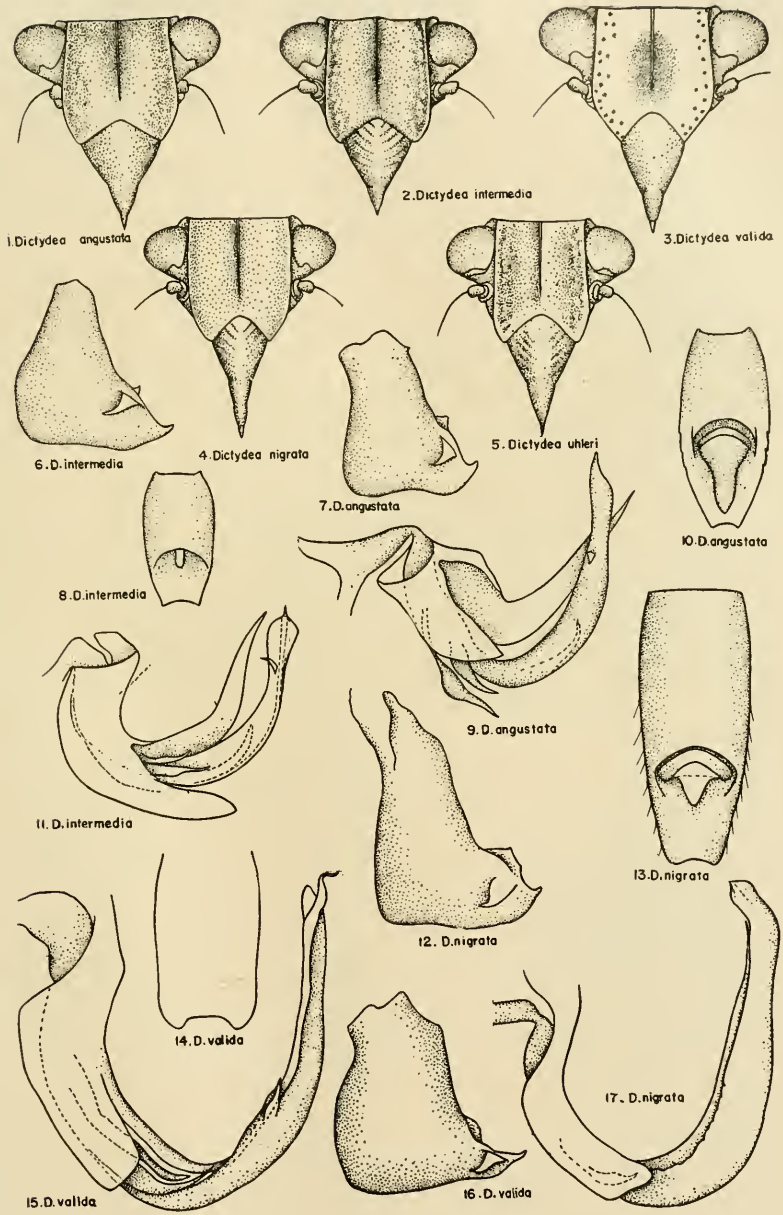

1.Dictydea angustata
2.Dictydea intermedia
3.Dictydea valida
4.Dictydea nigrata
5.Dictydea uhleri
6.D.intermedia
7.D.angustata
8.D.intermedia
9.D.angustata
10.D.angustata
11.D.intermedia
12.D.nigrata
13.D.nigrata
14.D.valida
15.D.valida
16.D.valida
17.D.nigrata

PLATE XV

1. Anal flap of *Osbornia arborea* Ball.
1a. Lateral view of harpago of *Osbornia arborea* Ball.
2. Dorsal view of *Papagona succinea* Ball.
2a. Cephalic aspect of head of *Papagona succinea* Ball.
2b. Lateral aspect of head of *Papagona succinea* Ball.
3. Lateral aspect of *Osbornia cornuta* Ball.
3a. Lateral aspect of harpago of *Osbornia cornuta* Ball.
3b. Anal flap of *Osbornia cornuta* Ball.
3c. Cephalic aspect of head of *Osbornia cornuta* Ball.
4. Dorsal aspect of *Osbornia arborea* Ball.
4a. Cephalic aspect of head of *Osbornia arborea* Ball.
5. Dorsal aspect of *Osbornia cornuta* Ball.

PLATE XV

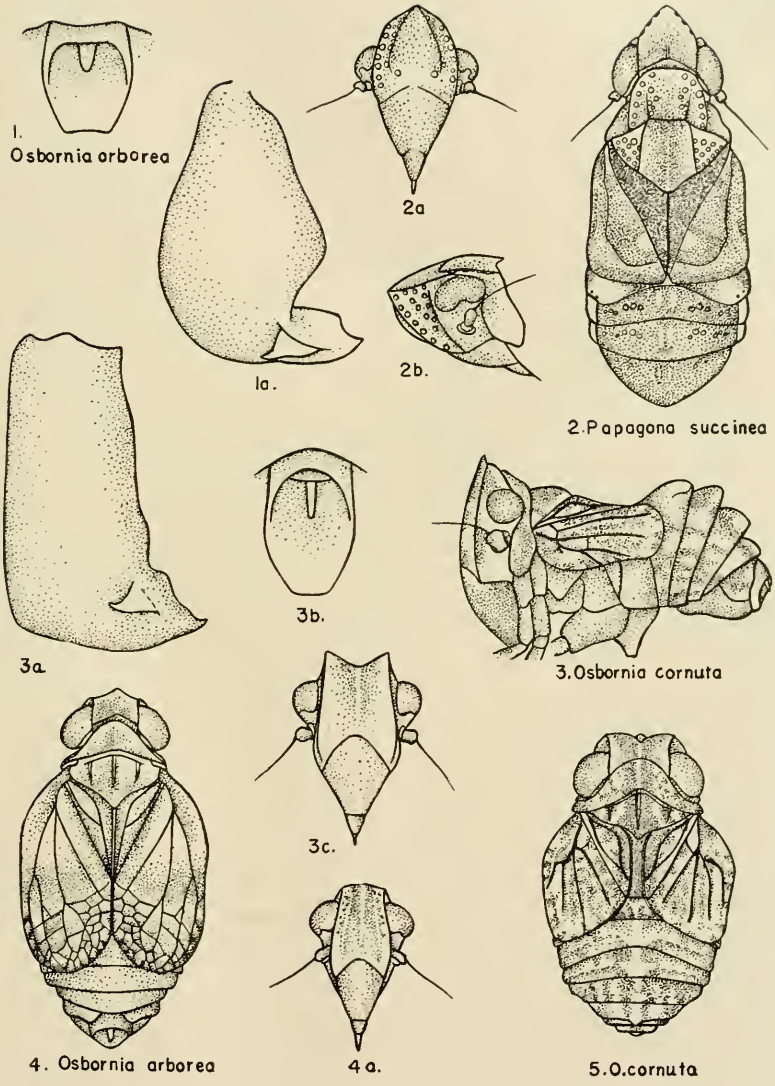

1.
Osbornia arborea
1a.
2a
2b.
2. Papagona succinea
3a
3b.
3. Osbornia cornuta
3c.
4. Osbornia arborea
4a.
5. O. cornuta

PLATE XVI

1. Left view of aedeagus and theca of *Osbornia cornuta* Ball.
1a. Right view of aedeagus and theca of *Osbornia cornuta* Ball.
2. Left view of aedeagus and theca of *Osbornia arborea* Ball.
2a. Right view of aedeagus and theca of *Osbornia arborea* Ball.
3. Anal flap of *Dictyobia varia* n. sp.
4. Lateral view of harpago of *Dictyobia varia* n. sp.
5. Lateral view of harpago of *Dictyobia permutata* Uhler.
6. Lateral view of harpago of *Dictyobia atra* VanDuz.
6a. Anal flap of *Dictyobia atra* VanDuz.
7. Left view of aedeagus and theca of *Dictyobia varia* n. sp.
8. Left view of aedeagus and theca of *Dictyobia permutata* Uhler.
8a. Anal flap of *Dictyobia permutata* Uhler.
9. Anal view of aedeagus and theca of *Dictyobia atra* VanDuz.

PLATE XVI

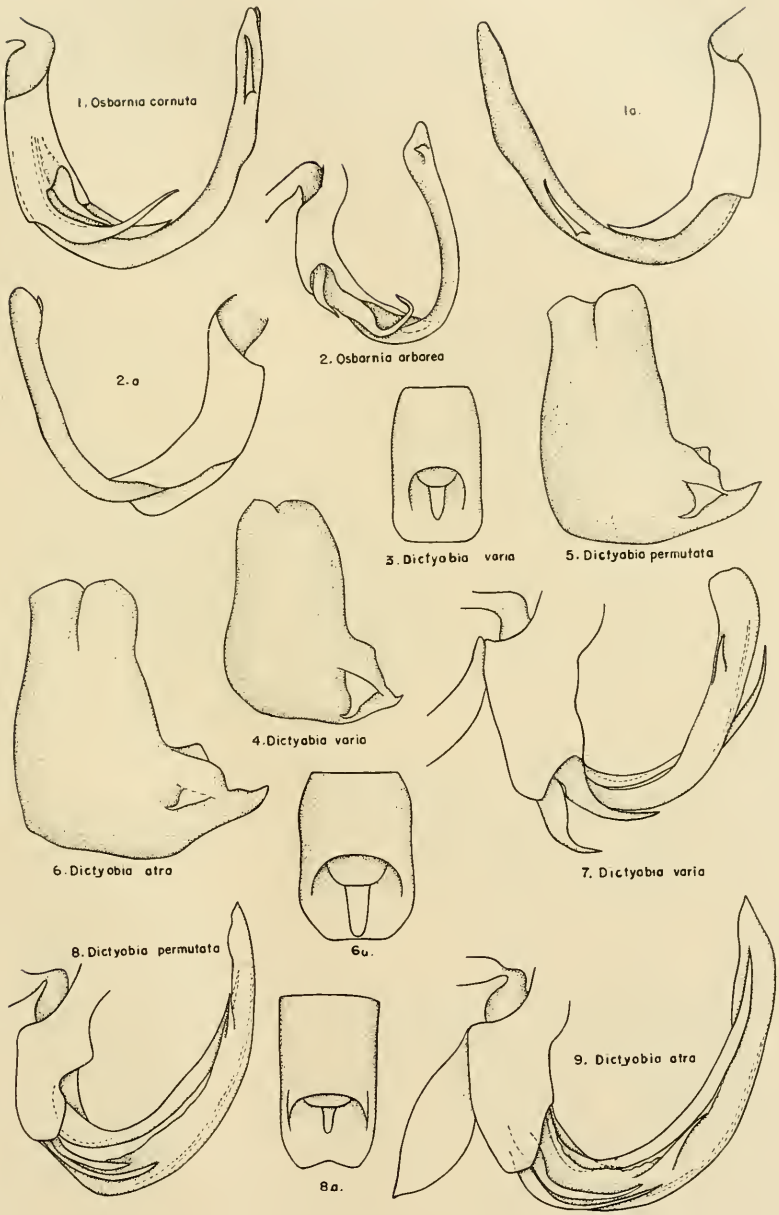

1. Osbarnia cornuta
1a.
2. Osbarnia arborea
2.a
3. Dictyobia varia
5. Dictyobia permutata
4. Dictyobia varia
6. Dictyobia atra
7. Dictyobia varia
6a.
8. Dictyobia permutata
8a.
9. Dictyobia atra

PLATE XVII

1. Cephalic aspect of head of *Dictyobia atra* VanDuz.
1a. Dorsal view of head of *Dictyobia atra* VanDuz.
2. Cephalic aspect of head of *Dictyobia combinata* Ball.
3. Cephalic aspect of head of *Dictyobia permutata* Uhler.
4. Cephalic aspect of head of *Dictyobia varia* n. sp.
4a. Dorsal aspect of head of *Dictyobia varia* n. sp.
5. Lateral aspect of *Dictyobia atra* VanDuz.
6. Dorsal aspect of head of *Dictyobia combinata* Ball.
7. Lateral aspect of *Dictyobia permutata* Uhler.
7a. Dorsal aspect of *Dictyobia permutata* Uhler.
8. Lateral aspect of *Dictyobia combinata* Ball.

PLATE XVII

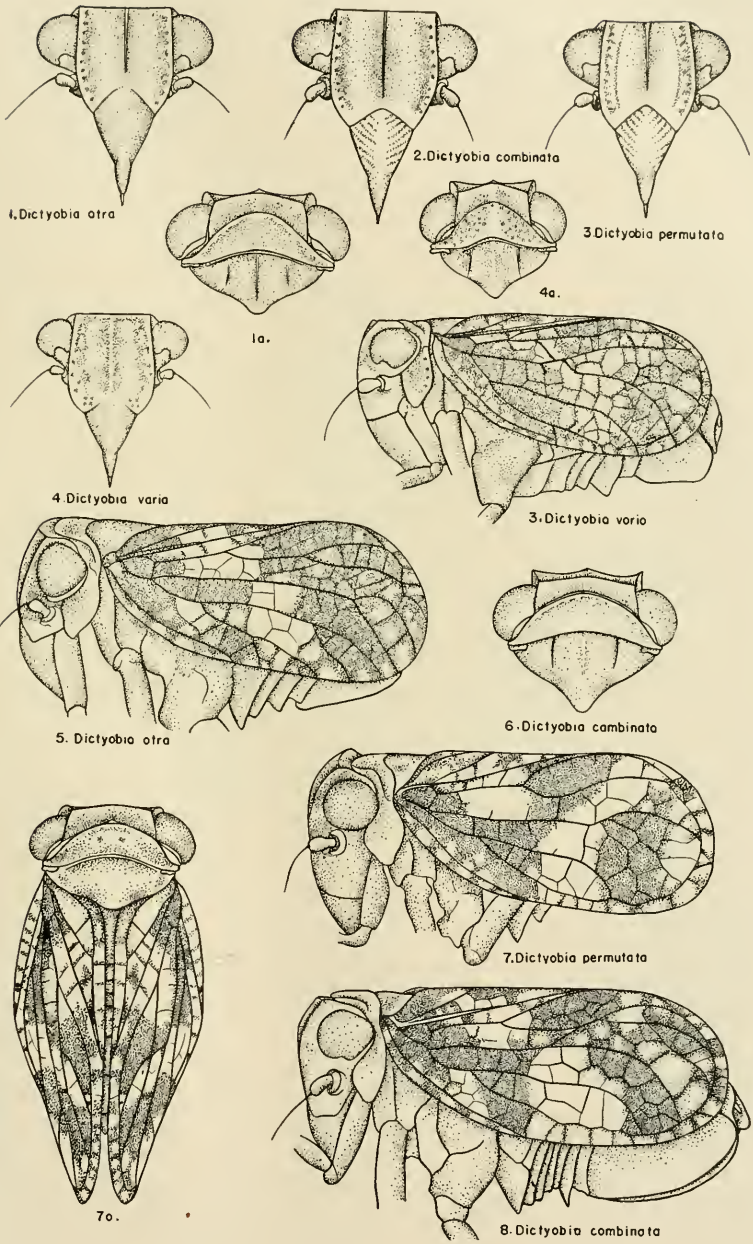

1. Dictyobia atra
2. Dictyobia combinata
3. Dictyobia permutata
1a.
4a.
4. Dictyobia varia
3. Dictyobia vorio
5. Dictyobia otra
6. Dictyobia cambinata
7. Dictyobia permutata
7o.
8. Dictyobia combinata

PLATE XVIII

1. Right view of aedeagus and theca of *Danepteryx adiuncta* n. sp.
2. Right view of aedeagus and theca of *Danepteryx lurida* Mel.
3. Right view of aedeagus and theca of *Danepteryx artemesiae* Kirk.
4. Right view of aedeagus and theca of *Danepteryx barbarae* Kirk.
5. Right view of aedeagus and theca of *Danepteryx robusta* n. sp.
6. Right view of aedeagus and theca of *Danepteryx manca* Uhler.
7. Dorsal view of *Danepteryx adiuncta* n. sp.
8. Cephalic aspect of head of *Danepteryx adiuncta* n. sp.
9. Caphalic aspect of head of *Danepteryx lurida* Mel.
10. Dorsal view of *Danepteryx lurida* Mel.
11. Cephalic aspect of head of *Danepteryx manca* Uhl.
12. Dorsal view of *Danepteryx robusta* n. sp.
13. Cephalic aspect of head of *Danepteryx robusta* n. sp.
14. Dorsal aspect of *Danepteryx barbarae* Kirk.
15. Cephalic aspect of head of *Danepteryx barbarae* Kirk.
16. Dorsal view of *Danepteryx manca* Uhler.
17. Cephalic aspect of head of *Danepteryx artemesiae* Kirk.
18. Dorsal view of *Danepteryx artemesiae* Kirk.

PLATE XVIII

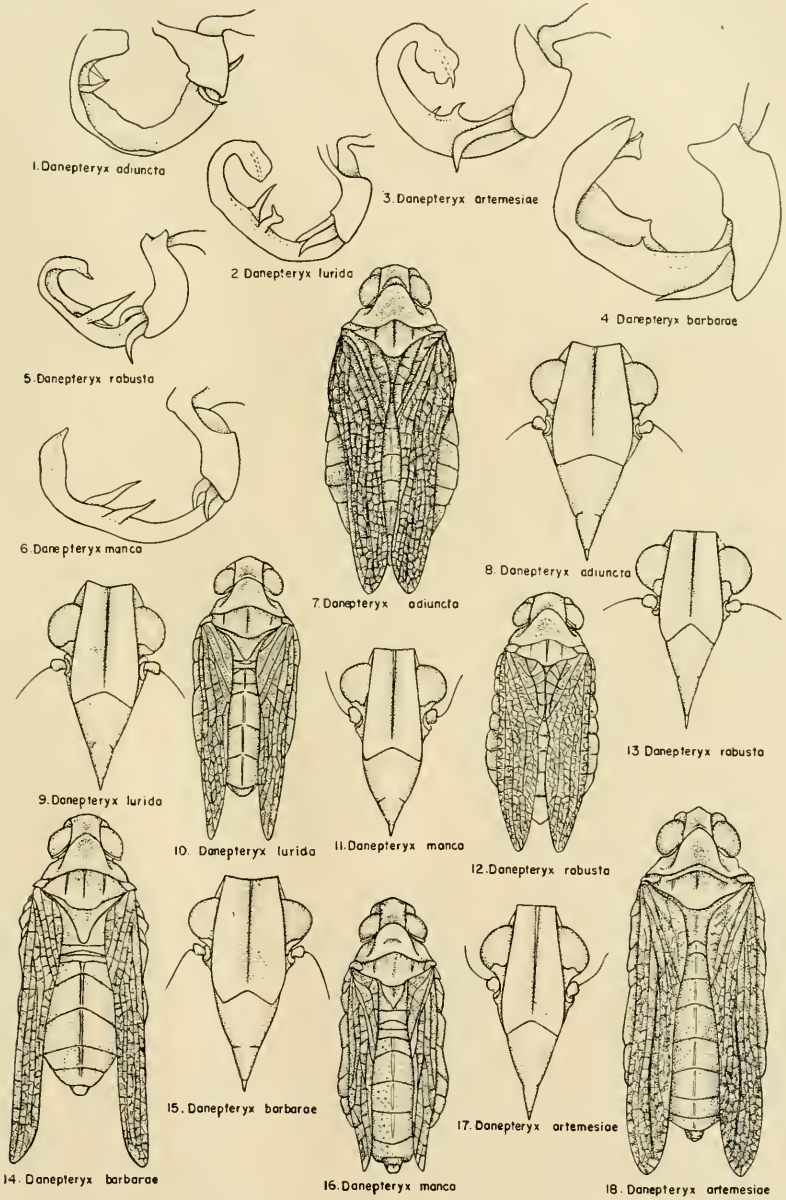

1. Danepteryx adiuncta
2 Danepteryx lurida
3. Danepteryx artemesiae
4 Danepteryx barbarae
5. Danepteryx robusta
6. Danepteryx manca
7. Danepteryx adiuncta
8. Danepteryx adiuncta
9. Danepteryx lurida
10. Danepteryx lurida
11. Danepteryx manca
12. Danepteryx robusta
13 Danepteryx robusta
14. Danepteryx barbarae
15. Danepteryx barbarae
16. Danepteryx manca
17. Danepteryx artemesiae
18. Danepteryx artemesiae

PLATE XIX

1. Lateral view of harpago of *Danepteryx artemesiae* Kirk.
1a. Anal flap of *Danepteryx artemesiae* Kirk.
2. Anal flap of *Danepteryx lurida* Mel.
2a. Lateral view of harpago of *Danepteryx lurida* Mel.
3. Lateral view of harpago of *Danepteryx adiuneta* n. sp.
3a. Anal flap of *Danepteryx adiuncta* n. sp.
4. Lateral view of harpago of *Danepteryx manca* Uhler.
4a. Anal flap of *Danepteryx manca* Uhler.
5. Lateral view of harpago of *Danepteryx robusta* n. sp.
5a. Anal flap of *Danepteryx robusta* n. sp.
6. Dorsal view of *Bruchomorpha abrupta* Ball.
7. Dorsal view of *Bruchomorpha nodosa* n. sp.
8. Dorsal view of *Bruchomorpha oculata* Newman.
9. Dorsal view of *Bruchomorpha rosea* n. sp.
10. Dorsal view of *Bruchomorpha beameri* n. sp.
11. Dorsal view of *Bruchomorpha extensa* Ball.

PLATE XIX

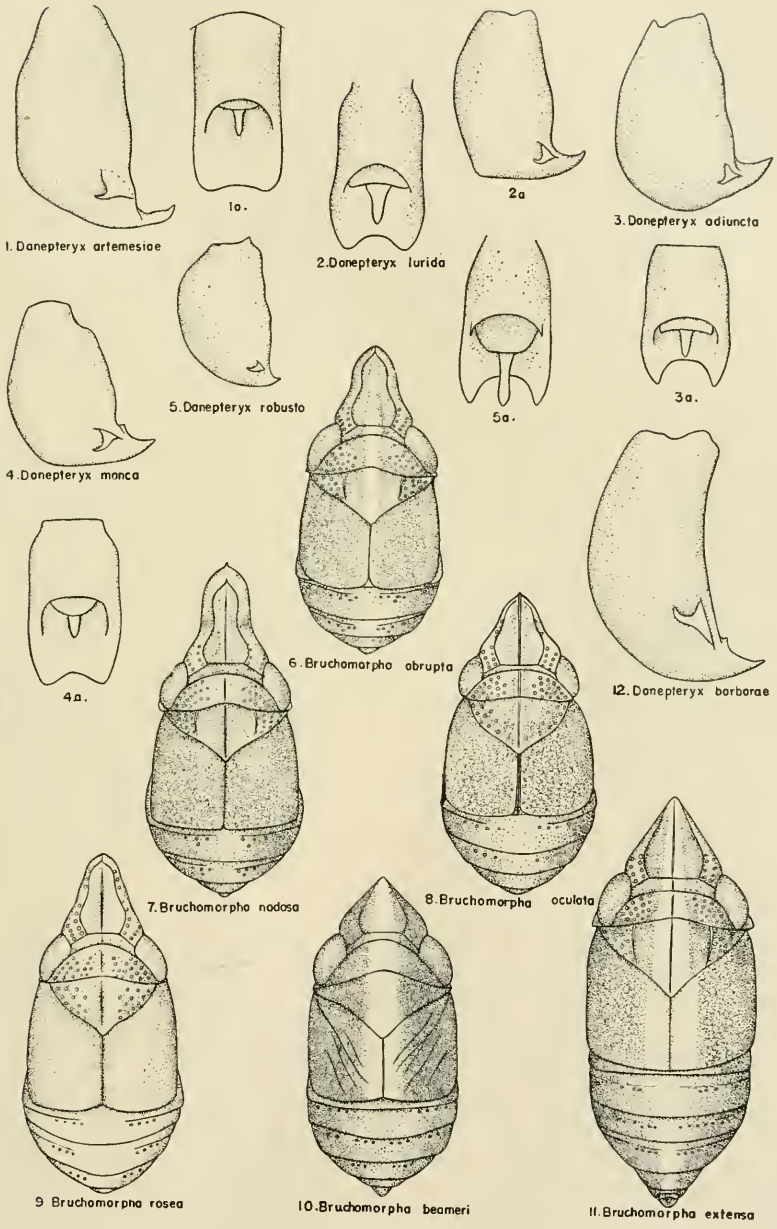

1. Donepteryx artemesiae
1a.
2. Donepteryx lurida
2a
3. Donepteryx adiuncta
3a.
4. Donepteryx monca
4a.
5. Donepteryx robusta
5a.
6. Bruchomorpha obrupta
7. Bruchomorpha nodosa
8. Bruchomorpha oculata
9 Bruchomorpha rosea
10. Bruchomorpha beameri
11. Bruchomorpha extensa
12. Donepteryx barbarae

PLATE XX

1. Dorsal view of *Bruchomorpha triunata* Ball.
2. Dorsal view of *Bruchomorpha mormo* Kirk.
3. Dorsal view of *Bruchomorpha bunni* n. sp.
4. Dorsal view of *Bruchomorpha minima* Metc.
5. Dorsal view of *Bruchomorpha suturalis* Mel.
6. Dorsal view of *Bruchomorpha pallidipes* Stal.
7. Dorsal view of *Bruchomorpha rugosa* Metc.
8. Dorsal view of *Bruchomorpha tenebrosa* n. sp.
9. Dorsal view of *Bruchomorpha dorsata* Fitch.
10. Dorsal view of *Bruchomorpha keidensia* n. sp.
11. Dorsal view of *Bruchomorpha vittata* Metc.
12. Dorsal view of *Bruchomorpha jocosa,* female.
13. Dorsal view of *Bruchomorpha jocosa,* male.
14. Dorsal view of *Bruchomorpha decorata* Metc.
15. Dorsal view of *Bruchomorpha tristis* Stal.

PLATE XX

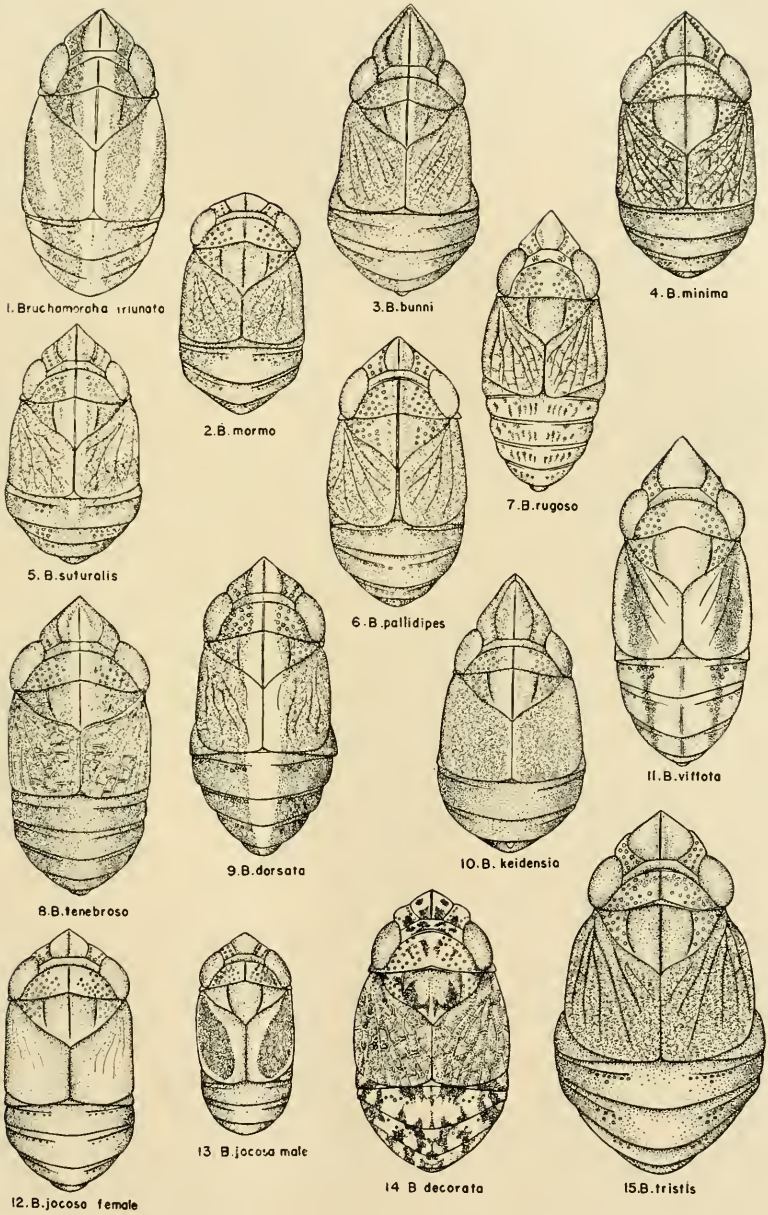
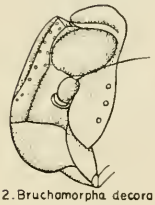

1. Bruchomorpha triunata
2. B. mormo
3. B. bunni
4. B. minima
5. B. suturalis
6. B. pallidipes
7. B. rugoso
8. B. tenebroso
9. B. dorsata
10. B. keidensis
11. B. vittata
12. B. jocosa female
13 B. jocosa male
14 B decorata
15. B. tristis

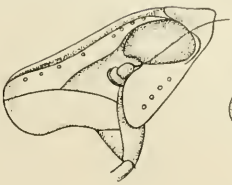
PLATE XXI

1. Lateral view of head of *Bruchomorpha pallidipes* Stal.
2. Lateral view of head of *Bruchomorpha decorata* Metc.
3. Lateral view of head of *Bruchomorpha extensa* Ball.
4. Lateral view of head of *Bruchomorpha keidensia* n. sp.
5. Lateral view of head of *Bruchomorpha vittata* Metc.
6. Lateral view of head of *Bruchomorpha jocosa* Stal.
7. Lateral view of head of *Bruchomorpha beameri* n. sp.
8. Lateral view of head of *Bruchomorpha tenebrosa* n. sp.
9. Lateral view of head of *Bruchomorpha rugosa* Metc.
10. Lateral view of head of *Bruchomorpha dorsata* Fitch.
11. Lateral view of head of *Bruchomorpha abrupta* Ball.
12. Lateral view of head of *Bruchomorpha oculata* Newman.
13. Lateral view of head of *Bruchomorpha triunata* Ball.
14. Lateral view of head of *Bruchomorpha minima* Metc.
15. Lateral view of head of *Bruchomorpha bunni* n. sp.
16. Lateral view of head of *Bruchomorpha nodosa* n. sp.
17. Lateral view of head of *Bruchomorpha mormo* Kirk.
18. Lateral view of head of *Bruchomorpha suturalis* Mel.
19. Lateral view of head of *Bruchomorpha tristis* Stal.
20. Lateral view of head of *Bruchomorpha rosea* n. sp.
21. Wing of *Bruchomorpha oculata* Newman.
22. Wing of *Bruchomorpha keidensia* n. sp.
23. Wing of *Bruchomorpha pallidipes* Stal.

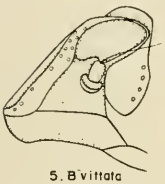
PLATE XXI

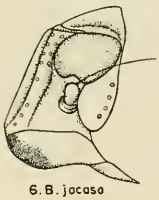
1. Bruchomarpha pallidipes

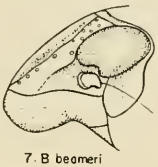

2. Bruchomorpha decorata


3. B. extensa

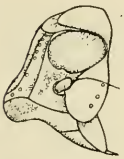
4. B. keidensia

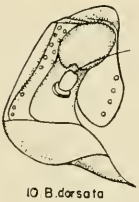

5. B. vittata

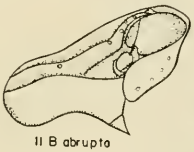

6. B. jacasa

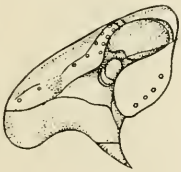

7. B. beameri

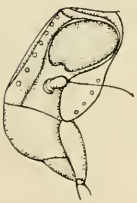
8. B. tenebrosa


9. B. rugosa

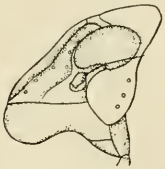

10. B. dorsata

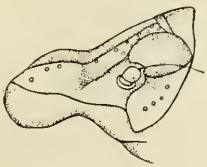

11. B. abrupta

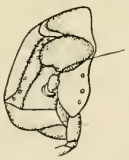

12. B. oculata


13. B. triunata

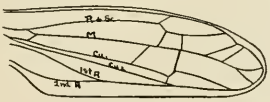
14. B. minima

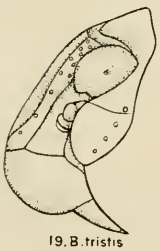

15. B. bunni


16. B. nodosa

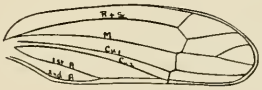

17. B. mormo

18. B. suturalis


21. B. aculata


19. B. tristis

20. B. rosea


22. B. keidensia

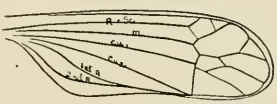

B. pallidipes

PLATE XXII

1. Lateral view of aedeagus and theca of *Bruchomorpha extensa* Ball.
1a. Lateral view of harpago of *Bruchomorpha extensa* Ball.
2. Lateral view of aedeagus and theca of *Bruchomorpha triunata* Ball.
2a. Lateral view of harpago of *Bruchomorpha triunata* Ball.
2b. Anal flap of *Bruchomorpha triunata* Ball.
3. Lateral view of aedeagus and theca of *Bruchomorpha suturalis* Mel.
3a. Lateral view of harpago of *Bruchomorpha suturalis* Mel.
3b. Anal flap of *Bruchomorpha suturalis* Mel.
4. Lateral view of aedeagus and theca of *Bruchomorpha bunni* n. sp.
4a. Lateral view of harpago of *Bruchomorpha bunni* n. sp.
5. Lateral view of aedeagus and theca of *Bruchomorpha keidensia* n. sp.
5a. Lateral view of harpago of *Bruchomorpha keidensia* n. sp.
5b. Anal flap of *Bruchomorpha keidensia* n. sp.
6. Lateral view of aedeagus and theca of *Bruchomorpha dorsata* Fitch.
6a. Lateral view of harpago of *Bruchomorpha dorsata* Fitch.
6b. Anal flap of *Bruchomorpha dorsata* Fitch.
7. Lateral view of aedeagus and theca of *Bruchomorpha mormo* Kirk.
7a. Lateral view of harpago of *Bruchomorpha mormo* Kirk.
7b. Anal flap of *Bruchomorpha mormo* Kirk.
8. Lateral view of aedeagus and theca of *Bruchomorpha abrupta* Ball.
8a. Lateral view of harpago of *Bruchomorpha abrupta* Ball.
8b. Anal flap of *Bruchomorpha abrupta* Ball.
9. Lateral view of aedeagus and theca of *Bruchomorpha pallidipes* Stal.
9a. Lateral view of harpago of *Bruchomorpha pallidipes* Stal.
9b. Anal flap of *Bruchomorpha pallidipes* Stal.
10. Lateral view of aedeagus and theca of *Bruchomorpha jocosa* Stal.
10a. Lateral view of harpago of *Bruchomorpha jocosa* Stal.
10b. Anal flap of *Bruchomorpha jocosa* Stal.
11. Lateral view of aedeagus and theca of *Bruchomorpha vittata* Metc.
11a. Lateral view of harpago of *Bruchomorpha vittata* Metc.
11b. Anal flap of *Bruchomorpha vittata* Metc.
12. Lateral view of aedeagus and theca of *Bruchomorpha decorata* Metc.
12a. Lateral view of harpago of *Bruchomorpha decorata* Metc.
12b. Anal flap of *Bruchomorpha decorata* Metc.
13. Lateral view of aedeagus and theca of *Bruchomorpha minima* Metc.
13a. Lateral view of harpago of *Bruchomorpha minima* Metc.
13b. Anal flap of *Bruchomorpha minima* Metc.
14. Lateral view of aedeagus and theca of *Bruchomorpha rugosa* Metc.
14a. Lateral view of harpago of *Bruchomorpha rugosa* Metc.
14b. Anal flap of *Bruchomorpha rugosa* Metc.
15. Lateral view of aedeagus and theca of *Bruchomorpha rosea* n. sp.
15a. Lateral view of harpago of *Bruchomorpha rosea* n. sp.
15b. Anal flap of *Bruchomorpha rosea* n. sp.
16. Lateral view of aedeagus and theca of *Bruchomorpha tristis* Stal.
16a. Lateral view of harpago of *Bruchomorpha tristis* Stal.
16b. Anal flap of *Bruchomorpha tristis* Stal.
17. Lateral view of aedeagus and theca of *Bruchomorpha beameri* n. sp.
17a. Lateral view of harpago of *Bruchomorpha beameri* n. sp.
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18a. Anal flap of *Bruchomorpha oculata* Newman.
18b. Lateral view of harpago of *Bruchomorpha oculata* Newman.

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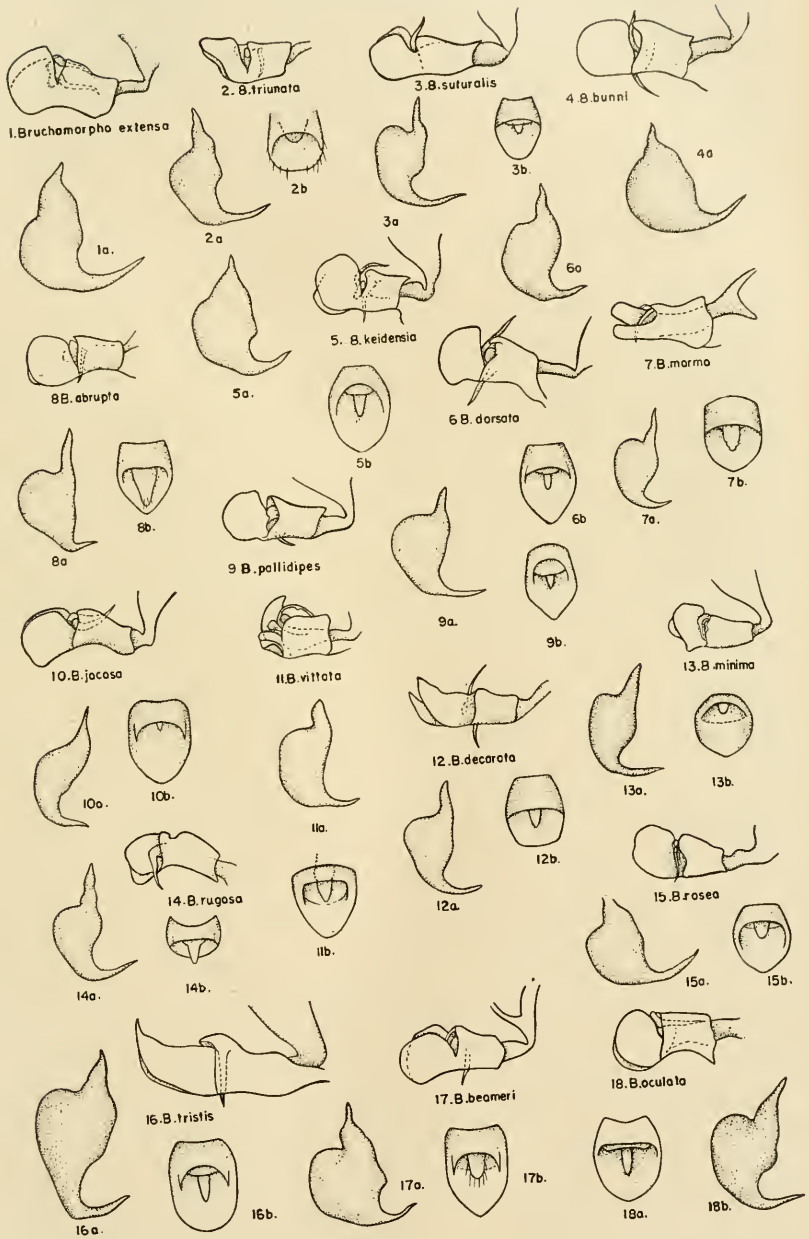
1.Bruchomorpho extensa
2. B.triunata
3.B.suturalis
4 B.bunni
1a.
2b
2a
3a
3b.
4a
6a
5. B. keidensia
5a.
8B. abrupta
7.B.marmo
6 B. dorsata
5b
8b.
8a
9 B. pallidipes
6b
7a.
7b.
9a.
9b.
10.B.jocosa
11.B.vittata
13.B.minima
12.B.decorata
10a.
10b.
11a.
13a.
13b.
12b.
12a.
15.B.rosea
14.B.rugosa
11b.
14a.
14b.
15a.
15b.
16.B.tristis
17.B.beameri
18.B.oculata
16a.
16b.
17a.
17b.
18a.
18b.

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The Genus Norvellina

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ABSTRACT: This paper is a systematic study of the species considered in the genus Norvellina at various times since its erection by Doctor Ball in 1931. The following nineteen species are retained: *Norvellina mildredae, perelegantis, pullata, pulchella, pannosa, rubida, scitula, ehenopodii, seminuda, columbiana, snowi, saucia, nevada, texana, bicolorata, apachana, helenae, elarivida* and *seaber*. *N. oregona* Ball is placed in synonomy with *N. rubida* (Ball), and the following two new varieties and eight new species are named: *N. mildredae* var. *minuta, bicolorata* var. *inflata, flavida, vermiculata, varia, numerosa, excavata, rostrata, curvata* and *glauca*. Drawings of heads and pronota of both males and females of each species, as well as male genitalia and five full length dorsal views to illustrate types of markings, are included.

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THE GENUS NORVELLINA

(HOMOPTERA, CICADELLIDAE)

THIS paper is an attempt to define the generic concepts of the genus *Norvellina* and to present a systematic treatment of the species, old and new, contained within the genus. In the preparation of this paper the writer is deeply indebted to Dr. R. H. Beamer, under whom the study was carried on and without whose advice and encouragement the endeavor would have perished; to Dr. E. D. Ball, whose generous loan of type material and gift of information concerning the host preferences of some of the closely related species enabled the writer to confirm specific differences in structure; to Mr. P. W. Oman for the valuable loan of undetermined material and for numerous comparisons with types in the National Museum as well as general information on the genus; to Mr. E. W. Davis for the unselfish loan of all his material in this and related genera for study; and to Colorado State College for the loan of type material from their collection.

SYNOPSIS OF THE GENUS

The genus *Norvellina* was erected in 1931 by Dr. E. D. Ball and *Eutettix mildredae* Ball designated as Genotype. The following is the generic description (Fla. Ent., XV, p. 2, 1931):

"Resembling *Eutettix* in the transverse depression on vertex and single cross nervure; much narrower and trimmer in build with definite pattern or saddle markings.

Vertex much broader than long, almost parallel margined, broadly rounded or slightly angulate with front. Head with the eyes equalling the pronotum or folded elytra in width. Pronotum decidedly longer than in *Platymetopius* and its allies. As seen from the side, the pronotum is strongly arched and sloping down in front, the vertex sloping in the same curve until just before the apex where there is a definite horizontal shelf which extends from eye to eye, anterior margin bluntly rounding and almost right-angled with face. Elytra closely folded at rest. Venation simple, regular, only one cross nervure, no true costal veinlets except the two at the ends of the first apical cell. Elytra covered by a 'saddle' pattern made up of contrasting colours and reticulations.

This genus embraces some twenty or more largely western species of which *Eutettix seminuda* (Say) and *chenopodii* Osb. are the common eastern representatives. From *Eutettix, sensus strict,* they are readily separated by the saddle pattern, the vermiculate reticulations and the narrower, lighter form. The genital pattern is simple and of relatively little value in either group."

The "twenty or more" species referred to above can be reasonably determined by a process of elimination, since in the same publication with the above description Doctor Ball placed *clarivida, insana, paupercula, tenella* and *stricta* in the genus *Opsius.* In later writings they have been placed in *Norvellina,* as well as the twenty-one following species:

mildredae	*amanda*	*rubida*
perelegantis	*snowi*	*texana*
pullata	*saucia*	*ziczac*
scitula	*nevada*	*bicolorata*
chenopodii	*pulchella*	*apachana*
seminuda	*albida*	*helenae*
columbiana	*pannosa*	*oregona*

Numerous dissections of the males of the species definitely *Norvellina* on the basis of the "saddle marking" brought forth the following nearly stable characters which may serve to help limit the genus. The main generic character apparently is a pygofer generally rounding on the ventral margin to a dorsally directed hook arising on the posterior margin. Variations in the width of the pygofer are frequent and specific, but only one species, *N. pulchella* (Bak.), in which the hook arises on the involute ventral margin of the pygofer and is directed posteriorly, varies from the general

definition in respect to the hook. A second character found constant in its general structure is the aedeagus, which consists of a somewhat foot-shaped base, from the heel of which arises a tubular shaft with two more or less closely appressed ventrolateral processes arising near the base and usually extending about the length of the shaft. The variations in the shape of this structure were found to be specific within the known species. In addition the styles of all the forms are inwardly geniculate on the distal half, the apical portions of which are more or less cylindrical, varying slightly in length and curvature.

On the basis of the above limiting characters further dissections were made of all the species in question, as well as numerous other forms showing external similarities. As a result the following nineteen species are herein retained in the genus *Norvellina:*

mildredae	*snowi*	*texana*
perelegantis	*saucia*	*bicolorata*
pullata	*nevada*	*apachana*
scitula	*pulchella*	*helenae*
chenopodii	*pannosa*	*clarivida*
sciminuda	*rubida*	*scaber*
columbiana		

One species is placed in synonomy (*N. oregona* Ball is a synonoym of *N. rubida*) and the following two new varieties and eight new species were described in Jour. Kans. Ent. Soc. Vol. 11, 1938:

mildredae var. *minuta*	*numerosa*
bicolorata var. *inflata*	*excavata*
flavida	*rostrata*
vermiculata	*curvata*
varia	*glauca*

A few additional specimens are at hand which differ considerably from the above listed forms, but further collecting is necessary to establish their validity as good species.

The seven species and one variety that follow do not agree with the *Norvellina* structures and are disposed of, by Mr. P. W. Oman of the National Museum, as follows:

Eutettix ziczac Crumb is a synonym of *Phlepsius utahnus* Ball.

Eutettix stricta Ball belongs in the genus *Ollarianus* Ball.

Eutettix amanda Ball————?

Eutettix tenella (Baker) should remain in *Eutettix* for the present.

Eutettix insana Ball, *E. insana* var. *coronata* Ball, *E. paupercula* (Ball) and *Plepsius albidus* Ball seem to be congeneric and probably need a new genus.

A study of the genus, as it is considered here, reveals that there are three main types of patterns, one of which is the original "saddle" pattern under which subdivisions may be made. Of the other two, one is the type in which the dark pattern is confined to the anterior and posterior regions, leaving the basal two-thirds of the elytra without markings, while the other is simply a lack of any definite pattern, as exemplified in *N. clarivida*, *texana* and *glauca*. In the first case *N. apachana*, *bicolorata* and *bicolorata* var. *inflata* are the examples. The remaining twenty-three species bear a saddle of some kind, varying from the definite median pattern extending from the vertex to the unions of the claval sutures and mesal margins where it flares to the costal plaques, to patterns representing the remnants of this solid pattern.

General Distribution

The genus Norvellina is a native insect of North America and in general a western and southwestern form, many species of which are indigenous to mountain and submountain regions. According to Doctor Ball they are more or less constant in host preference. Only two specimens from Mexico have been examined by the writer, although certain of the other known species probably occur there. A few species, such as *N. seminuda* (Say), occur in general distribution in the east and central states. *N. chenopodii* (Osborn) apparently is widely distributed over the northern portion of the United States and the southern provinces of Canada as well as south at least through Kansas. *N. helenae* Ball occurs throughout the southern states and cotton belt and north into Kansas and Nebraska, where apparently it hybridizes with *N. chenopodii* (Osborn) which it so closely resembles. Most of the other forms are distinctly western in distribution and comparatively rare in occurrence, as evidenced by the short series taken at any one time and place.

Technique in Study

As a result of numerous dissections it was found the most advisable method of studying the genitalia of the males of this genus is as follows: After briefly boiling the detached abdomen in ten per cent caustic potash, rinsing in water, and placing in a drop of glycerin upon a slide, the genital capsule is split along the lateral sutures. The pygofer and the combination of valve, plates, styles and aedeagus are then spread separately. In turn these are flattened under a cover slip, the slide numbered to correspond to the pinned specimen, and the above structures microphotographed. These photographs are in reality only negative prints, since they are made

by projection directly upon photostat paper. Most of the comparative study was from these enlarged and easily compared pictures, and all descriptions and illustrations of the genital structures were made from such slides. Drawings of aedeagi and pygofers were made by projection.

KEY TO THE SPECIES OF NORVELLINA

1. With color pattern on elytra 2
   Without color pattern on elytra 27
2. (1) Only apices of elytra with definite marking 3
   More than apices of elytra showing pattern 5
3. (2) Elytra grayish yellow flecked with brown and with brown dot at distal end of clavus; slender form, 4 to 4.5 mm. long ..... *apachana* (Fig. 1), p. 176
   Elytra usually bright yellow, only apical portion infuscate; stout forms 4
4. (3) Large forms, 5.5 to 7 mm. long, with frons at normal curve with horizontal plane ..... *bicolorata* (Fig. 2), p. 176
   Smaller forms, 5 to 6 mm. long, and with distinctly bulging frons ..... *bicolorata* var. *inflata* (Fig. 3), p. 178
5. (2) Median pattern on elytra broken or nearly broken on clavus giving appearance of two transverse light bands, or if nearly solid usually with scutellum appearing light against dark background 6
   Median pattern extending solidly from pronotum to near apices 10
6. (5) Median pattern distinctly broken on clavus leaving transverse brown saddle; corium anterior to saddle white, seldom vermiculate 7
   Median pattern nearly broken, but at least with vermiculations along mesal borders on clavus between saddle and scutellum 8
7. (6) Saddle cinnamon brown against white background; pronotum usually streaked with gray; scutellum tan to fuscous on corners ..... *seminuda* (Fig. 4), p. 179
   Saddle not so distinct, pronotum fuscous, basal one-third of clavus lightly vermiculate ..... *scitula* (Fig. 5), p. 180
8. (6) Elytra with three mesal pairs of conspicuous dark spots on clavus ..... *pullata* (Fig. 6), p. 181
   Elytra usually without paired mesal dark spots, at least inconspicuous 9
9. (8) Species usually 5 to 5.5 mm. long (sometimes smaller in their southern range), commonly plump, with scutellum appearing lighter than background; aedeagus with rounded apex extending distinctly beyond lateral processes; last ventral segment of female usually with notched median lobe which may vary to a broad, notched strap; central and northern in distribution *chenopodii* (Fig. 7), p. 182
   Species usually, 4.25 to 4.75 mm. long, more slender with scutellum generally as dark as background aedeagus with inwardly hooked apex, lateral processes as long as shaft and flared laterally on distal one-fourth; last ventral female segment usually with distinct straplike process distinctly bifid; central and southern in distribution ..... *helenae* (Fig. 8), p. 183
10. (5) Most of median pattern composed of fuscous vermiculations evenly distributed 14
    Median pattern mostly gray to fumose, sometimes indistinct 11
11. (10) Median pattern varying from faint tan hue to distinct pattern, mostly fumose with occasional small fuscous spots ..... *snowi* (Fig. 9), p. 184
    Median pattern distinct, mostly gray fumose with irregular dark border composed of heavy vermiculations 12
12. (11) Apical third of scutellum mostly infuscate ..... *perelegantis* (Fig. 10), p. 185
    Apical third of scutellum mostly light colored 13
13. (12) Large species, 5.5 to 6 mm. long, usually plump in appearance ..... *mildredae* (Fig. 11), p. 186
    Smaller species, 4.25 to 4.75 mm. in length ..... *mildredae* var. *minuta* (Fig. 12), p. 188
14. (10) Median pattern appearing reddish-brown with contrasting light background on corium 15
    Median pattern dark, but usually not appearing reddish-brown and without sharp contrast with background 23

15. (14) Anterior margin of vertex distinctly more produced at center than next eyes, 18
Margins of vertex nearly parallel 16
16. (15) Large forms, 5 to 5.8 mm. long, with broad head, vertex three and one-half times wider between eyes than length at center..... *scaber* (Fig. 13), p. 188
Smaller, more slender forms, 5 mm. or less in length..... 17
17. (16) Costal margin anterior to costal plaque usually broadly suffused with canary yellow; male pygofer hook vestigial..... *flavida* (Fig. 14), p. 189
Costal margin anterior to costal plaque usually semihyaline, occasionally with white pruinose spots; male pygofer with large arm coming off midventral margin and extending posteriorly ..... *pulchella* (Fig. 15), p. 190
18. (15) Markings on vertex usually consisting of irrorations or sparse vermiculations, 19
Markings on vertex consisting of a broad, usually solidly fuscous area, mostly posterior to transverse depression..... 23
19. (18) Pronotum light with some very sparse vermiculations and with an irregular dark spot behind each eye..... *columbiana* (Fig. 16), p. 191
Pronotum marked with fuscous vermiculations, varying from nearly solidly fuscous with light punctate spots to irrorations grouped so as to leave three light longitudinal lines.....*saucia* group, 20
20. (19) Median pattern reddish-brown, composed of vermiculations on tan to brown background 21
Median pattern grayish to brown, composed of coarse vermiculations on a light background; male pygofer narrow, aedeagus thickened and curved with lateral processes closely appressed and not attaining the more or less rounded apex ..... *vermiculata* (Fig. 17), p. 192
21. (20) Pronotum mostly dark fuscous without longitudinal light lines; aedeagus curved at base but straightening toward apex which is bluntly rounding; lateral processes not closely appressed and exceeding apex of aedeagus ..... *varia* (Fig. 18,) p. 193
Pronotum not solidly fuscous but usually showing 3 longitudinal light lines.. 22
22. (21) Aedeagus long, slender and with inwardly projecting fingerlike process at apex; lateral prcoesses shorter than aedeagus..... *saucia* (Fig. 19), p. 194
Aedeagus short, thickened and curved with blunt apex; lateral processes distinctly longer than aedeagus ..... *numerosa* (Fig. 20), p. 195
23. (18) Vertex strongly produced at center with deep transverse depression; small forms, about 4 to 4.25 mm. long, with apical cells of elytra shortened to nearly equal dimensions ..... *rubida* (Fig. 21), p. 197
Vertex either not strongly produced at center, or if produced without distinct transverse depression 24
24. (23) Vertex anterior to transverse depression light-colored without markings or with only six minute brown spots on anterior margin; anterior margin of fuscous area back of depression usually cut into by two rounding, light areas, one each side of median line ..... *excavata* (Fig. 22), p. 198
Vertex anterior to transcerse depression usually with two or four extensions from fuscous area to anterior margin of vertex; aedeagus of male with thin, keel-shaped plate extending posteriorly, lateral processes fitting along the posterior curve of this extension..... *rostrata* (Fig. 23), p. 199
25. (14) Vertex angulate, distinctly over half as long as width between eyes, small forms, 4 to 4.5 mm. long, and slender with nearly parallel sides ..... *pannosa* (Fig. 24), p. 200
Vertex rounded to obtusely angulate from dorsal view, distinctly less than half as long as width between eyes..... 26
26. (25) Median pattern of elytra usually extending irregularly to claval suture on basal half of clavus ..... *curvata* (Fig. 25), p. 201
Median pattern not quite reaching claval suture on basal half of clavus ..... *nevada* (Fig. 26), p. 202
27. (1) General color usually green, elytra without pattern; 4 black spots on vertex ..... *clarivida* (Fig. 27), p. 203
General color not green; vertex spots not black..... 28
28. (27) Vertex angulate, usually with 4 minute brown spots on anterior margin ..... *glauca* (Fig. 28), p. 204
Vertex usually rounding to front, vertex without markings..*texana* (Fig. 29), p. 205

Norvellina apachana Ball

(Plates XXIII, XXVII, XXX; fig. 1)

Norvellina apachana Ball, E. D., Fla. Ent., XV, 1, p. 4, 1931.

The original description is as follows:

"Resembling *bicolorata*, but smaller and with obscure markings throughout. Size and form of *nevada*, but less heavily marked. Pronotum, scutellum and an oblique spot on apex of elytra heavily irrorate with brown, the saddle very obscure. Length, 4-4.5 mm.

Vertex shorter than in *saucia* which it otherwise resembles, twice wider than long, scarcely longer on middle than against eye. Front narrower and less inflated than in *saucia*, much less than in *bicolorata*. Female segment rounding posteriorly, deeply triangularly excavated with a broad straplike projection. Male plates long, triangular as in *saucia*.

Color. Face and vertex pale creamy, the latter with three to five irregular irrorations on posterior half. Pronotum ivory, heavily and irregularly irrorate with brown. Scutellum almost solid brown with seven white spots around the margin. Elytra with a very obscure saddle marking of pale brown, a brown wash over the ivory areas, a dark spot some distance back of the cross nervure on either side and a third one at apex of clavus. The vermiculations become more definite before the long oblique apical spot.

Holotype female, allotype male, and seven paratypes, Granite Dell, Ariz., August 17, 1929, and six paratypes Glenn Oaks, Ariz., October 9, 1929, all taken by the writer."

Genitalia. Last ventral segment of female as above. Male valve obtusely angulate, less than one-half as long at center as preceding segment; male plates converging to narrow point, over twice as long as greatest width. Aedeagus in lateral view stout and curved dorsally, apex rounded to inner margin, with a pair of ventrolateral processes arising basally, closely appressed to shaft except at spearlike apices ending slightly before apex of shaft. Pygofer about twice as long as median width, with dorsally directed free portion of hook about as long as width of pigmented tip of pygofer.

Four male specimens are at hand from the type locality as well as several specimens from Yavapai county, Arizona; Chiricahua Mountains, Arizona; Las Cruces, Vaughn, Belen and Hope, N. Mex.; collected from "Apache plume" (*Fallugia paradoxa*) from which it derives its name.

Norvellina bicolorata (Ball)

(Plates XXIII, XXVII, XXIX; fig. 2)

Eutettix bicolorata Ball, E. D., Can. Ent., XXVII, 1, p. 212, 1905.

Externally distinct, large forms. Aedeagus resembling *N. columbiana* (Ball), but more slender and with more pronounced bifid beak on inner apex. Length, 6.5 to 6.75 mm.; width, 2 mm.

Vertex broadly rounding, slightly more produced at center than next eyes; highly arched behind transverse depression, shelflike before, especially in females. Front inflated, meeting plane of vertex anterior to transverse depression at right angle or more; margin distinct, especially in females. Pronotum highly arched.

Color. Fuscous, and greenish-yellow. Vertex pale cream to tawny, with four small, dark spots on anterior margin between ocelli, one spot behind each ocellus, and with large more or less reticulate areas of fuscous in center of each half of posterior disc, usually with vermiculate extension fusing with spot behind ocellus. Pronotum heavily vermiculate or reticulate with fuscous, darker along anterior margin, especially touching each eye, and omitting numerous light areas and spots. Scutellum mostly brown to reticulate fuscous, with light triangular areas at each end of transverse suture. Elytra greenish-yellow to apex of clavus; posterior to clavus opaque white, heavily vermiculate with contrasting fuscous. Apical portion solidly fuscous with exception of one or two light spots in second or third apical cell and narrow hyaline margin.

Genitalia. Last ventral segment of female over twice as long as preceding, lateral margins rounded on posterior half, shallowly sinuate each side of the notched, slightly produced center. Male valve short, rounding posterior margin only slightly produced beyond preceding segment. Plates triangular, twice longer than broad. Aedeagus in lateral view thick at base, but with long, slender, dorsally curved shaft; apex avicephaliform with recurved bifid beak on inner margin, and a pair of ventrolateral processes arising basally and extending to near apex. Pygofer about one-third longer than median width, hook directed dorsally, narrow, slightly curved on inner margin and free portion nearly twice as long as apical width of pigmented area of pygofer.

> "Described from one female from Castle Hot Springs, Ariz., H. S. Barber collector (U. S. N. M. Collection) and four specimens taken by the author at Richfield, Utah."

Apparently Doctor Ball had both *N. bicolorata* and its smaller variety at hand when he wrote the original description. Therefore one of the specimens from Richfield, Utah, in the collection of Doctor Ball, is here designated Lectotype. Numerous specimens are at hand from the type locality, taken on *Ephedra,* and are distinct from the Arizona and California forms. Four specimens collected at Las Vegas, Nev. (Nov. 15, 1934, Davis and Dorst), in

the collection of E. W. Davis proved to contain two of this species and two of the smaller variety. Otherwise they are apparently definitely restricted in habitat.

Norvellina bicolorata var. *inflata* Lindsay

(Plates XXIII, XXVII, XXIX; fig. 3)

Jour. Kan. Ent. Soc., Vol. 11, p. 113, 1938

Closely resembling *N. bicolorata* (Ball), but readily separated by shorter length, extremely inflated front, usually fumate or whitish eyes, and normally immaculate, lemon-yellow elytra anterior to apex of clavus. Fuscous markings decidedly lighter and more sparse. Length, 5 to 5.5 mm., width, about 1.5 mm.

Vertex inflated, broadly rounding, slightly more produced at center than next eyes; highly arched behind transverse depression. Front bulbously inflated meeting plane of vertex at obtuse angle. Pronotum highly arched to horizontal scutellum.

Color. Vertex pale ivory to whitish, with two median spots of fuscous on anterior margin and a similar spot behind each ocellus; each half of disc posterior to transverse depression centered with a triangle of fuscous vermiculations. Front above matching background of vertex. Pronotum fuscous vermiculate with fumate to white background; the fuscous darker on anterior margin, especially touching eyes, and omitting irregularly patches of light background. Scutellum mostly light brown with white lateral margins except for fuscous spots on the margin posterior to transverse suture. Elytra anterior to apex of clavus usually bright lemon-yellow, sometimes faded to whitish; beyond clavus whitish, nearly hyaline, with fuscous veins and sparse vermiculations the extreme apical portion solidly fuscous except for hyaline margin and one round spot on tip of third apical cell.

Genitalia. As in *N. bicolorata* (Ball) except for slightly more slender aedeagus, apical beak shorter and less recurved and base not so heavy.

Holotype male, allotype female, White Sands, N. Mex., June 30, 1932, R. H. Beamer. Numerous paratypes from the following localities: Grand Canyon, Ariz.; Las Cruces, N. Mex.; Mojave, Cal.; Tucson, Ariz.; Yucca Grove, Cal.; Jacumba, Cal.; Palmdale, Cal.; St. George, Utah; and Las Vegas, Nev. Types and paratypes in the Snow Entomological Collection. Paratypes in collection of Doctor Ball and U. S. N. M.

Norvellina seminuda (Say)

(Plates XXIII, XXVII, XXIX; fig. 4)

Jassus seminudus Say, Ac. Nat'l. Sc. Phil., 6, p. 307, 1831.

Closely resembling *N. scitula* Ball, but with markings on vertex and pronotum light tawny and with basal elytra not distinctly vermiculate. Females easily distinguished by nearly truncate last ventral segment, with tapered, slightly bilobed median projection notched at either side.

Vertex rounding, only slightly longer at center than next the eyes; from lateral view arched back of transverse depression. Front at normal angle, margin definite. Pronotum arched, anterior margin more produced than posterior.

Color. Vertex light ivory with four pale yellowish spots on anterior margin and a similar spot behind each ocellus; posterior disc faintly marked with yellowish or fumate spots. Pronotum, except anterior and lateral margins, lightly fumose. Scutellum with yellow to tawny lateral corners and apical portion, except for extreme light tipped apex. Elytra with suggestion of transverse markings on bases, with completely transverse saddle of cinnamon brown extending from midclavus to mesal margin to apex of clavus and partially edged with fuscous. Apex of elytra lightly vermiculate with brown, mostly in third and fourth apical cells.

Genitalia. Last ventral segment of female nearly truncate posteriorly, with slightly bifid median straps notched at either side to a depth about one-half length of strap. Male valve roundingly produced at center to about three-fourths length of preceding *segment;* plates long-triangular. Styles on distal third narrowed, curving slightly laterad, pointed on outer margins at apices. Aedeagus thickened basally, with dorsally curved shaft tapered to apex where it is slightly enlarged, and with a pair of ventrolateral processes arising near base and tapering to points as long as shaft. Pygofer broad with slightly in-curved hook arising on ventral posterior margin, free on outer two-thirds, and extending dorsally nearly the width of the pygofer.

Neotype male, allotype female, Douglas county, Kansas, September, 1923, W. Robinson, described above, are here designated. Numerous specimens are at hand from the following states: Florida, Alabama, Mississippi, Louisiana, Texas, Kansas, Missouri, Nebraska, Iowa, Minnesota, Ohio, South Carolina, New Hampshire, Connecticut, New Jersey, and New York.

Norvellina scitula (Ball)

(Plates XXIII, XXVII, XXIX; fig. 5)

Eutettix scitula Ball, E. D., Can. Ent., XXXIII, p. 47, 1901.

The original description is as follows:

"Resembling *seminuda,* but with the pronotum darkened up. Length, 5.5 mm.; width, 1.5 mm.

Vertex almost parallel margined, twice wider than long, half the length of the pronotum, strongly depressed. Front rather flat, its length and breadth about equal. Pronotum long, its lateral angles distinct, disc but feebly convex.

Color. Vertex pale creamy yellow, six pale fulvous spots along the anterior margin, sometimes a pair of spots near eyes on basal half. Pronotum dull white, coarsely irrorate with dark fulvous, omitting the pale yellow anterior margin. Traces of three pale stripes. Scutellum pale, the fine dark-brown irrorations usually heaviest in a spot just within the basal angles on either side, and another behind the transverse suture. Three spots in a triangle on apical half ivory white; posterior disc light. Elytra milky white, a few coarse, brown irrorations along the humeral and sutural margins before the middle, a transverse band behind the middle as in *seminuda,* but darker brown, and some irregular infuscations towards apex. Face and below pale yellow, pale fuscous arcs on front.

Genitalia. Ultimate ventral segment of female twice the length of penultimate, the posterior margin slightly rounding, with two small, roundingly angular, median teeth; male valve obtusely triangular; plates long triangular, their apices attenuate, infuscate.

Described from numerous specimens from Fort Collins, Pueblo, Salida and Grand Junction, Colo. This species is most closely related to *seminuda,* but the genitalia and pronotal band will at once distinguish it."

Genitalia. As above, with aedeagus in lateral view stout, curved dorsally and tapering to a slightly flared, membranous apex, with a pair of ventrolateral processes arising near base and extending to apex, curved toward shaft on tips. Pygofer tapering toward a slender, slightly curved hook apically attached on basal third and free portion extending backward and dorsally at about a forty-five degree angle with the plane of the ventral margin.

Lectotype male, allotype female, Fort Collins, Colo., July 29, 1898, here designated and in the Colorado State Agricultural College collection. Other cotype specimens are at hand as well as numerous specimens from the west and southwest. This species apparently replaces *N. seminuda* (Say) in the states west of Texas and Kansas.

Norvellina pullata (Ball)

(Plates XXIII, XXVII, XXIX; fig. 6)

Eutettix pullata Ball, E. D., Can. Ent., XXXIII, p. 48, 1901.

The original description follows:

"Form and general appearance of *scitula,* but darker, approaching *perelegantis* in shade, but lacking the definite pattern of that species. Length, 5.5 mm.; width, 1.5 mm.

Vertex two and one-half times wider than long, half the length of the pronotum, transverse depression very shallow, front broad and flat. Pronotum rather flat, scutellum transversely depressed, the apex swollen, elevated.

Colour. Vertex white or pale yellow, a narrow fuscous line just in front of eyes, in front of which are four dots, and behind which are three large irregular, sometimes confluent, irrorate patches. Pronotum light, coarsely and somewhat sparsely irrorate with brown. Scutellum with a brownish fuscous patch just within each corner, disc pale or orange-yellow. Elytral pattern as in *scitula,* but broader and darker; clavus entirely reticulated except for two transverse bands, one at base and a broader, interrupted one before the middle, the white area of the corium with a few dots or reticulations.

Genitalia. Ultimate ventral segment of female three times the length of the penultimate, the posterior margin broadly rounding, the median fourth triangularly excavated, the apex of this excavation broad, rounding or bidentate; male genitalia as in *scitula,* valve obtuse, plates long triangular, the margins straight, tips attenuate.

Described from eighteen specimens from Manitou (Van Duzee), and five from Colorado Springs and Salida, Colo., by the author."

Genitalia. In addition to above, distal portion of styles stout, about one-half as long as in *seminuda,* and with inner margin at apex rounding. Aedeagus in lateral view short, shaft about one and one-half length of base, directed dorsally, membranous apex blunt, rounding on outer margin; ventrolateral processes arising near base and extending about length of shaft with tips acuminate, incurved. Pigmented pygofer narrow on posterior third, thickened hook broadly attached to posterior margin, free portion tapering dorsally at least length of attached base.

Lectotype female, Colorado Springs, August 7, allotype male, Salida, Colo., July 24, 1900, in the collection of Doctor Ball here designated and representing the two cotypes examined by the author. Other specimens in Doctor Ball's collection also examined were: One male, Richfield, Utah, August 7, 1904, described above; one male, Huachuca Mts., Arizona, Collected on pine; and two females and one male, Williamson Valley, Ariz. One female from Silver City, N. Mex., in the Snow Entomological Collection, and one female, Richfield, Utah, September 2, 1930, Willow Patch, in the collection of E. W. Davis, were also examined.

Norvellina chenopodii (Osborn)

(Plates XXIV, XXVII, XXIX; fig. 7)

Eutettix chenopodii Osb., H., Ohio Jl. Sc., XXIII, p. 161, 1923.

This is one of the most widely distributed species of the Norvellina, and, next to *N. seminuda* (Say), has been known longer than other forms in the genus, although prior to its description by Osborn it was confused with *Phlepsius strobi* Fitch. The original description follows:

"Similar to *Phlepsius strobi* Fitch, but with the vertex short, rounded to front and the elytral picture consisting of two whitish bands instead of three. Length, female, 5.5; male, 4.5.

Head slightly wider than pronotum; vertex short rounded in front with a shallow transverse depression, scarcely longer at middle than next the eye, obtusely angulate to front; front slightly longer than broad, clypeus short, scarcely widened at tip; lorae elongate, the tip reaching border of cheek. Pronotum more than twice as long as vertex, hind border concave.

Color, light fulvus irrorate with light yellow or whitish. Elytra brown, with two white bands, the forward one oblique and extending from tip of scutellum to costa at middle, the hinder one crossing the anteapical cells.

Genitalia. Female last ventral segment twice as long as preceding, hind border rounded with a notched lobe at the middle. Male valve rounded behind, plates triangular, tips acute.

This is a common species throughout the eastern U. S. and its nymph is found on lambs quarter (*Chenopodium*) where it produces purple spots that agree in color with the nymph. The description is from specimens collected in Iowa and Ohio, but records under the name of *strobi* carry its distribution from Maine to Utah and South to North Carolina and Texas.

The nomenclature of this species presents a peculiar puzzle as it was actually described by Van Duzee under the name *strobi* which, as shown above, must apply to a different species and the name would be preoccupied in *Phlepsius*. Ball, however, described the species, having placed it in *Eutettix* in which genus the name *strobi* has not been used for any other species. However, this was simply a transfer of the Van Duzee misnomer and as the species occurs on *Chenopodium* and not on *Strobus* it will avoid confusion to give it a new name and preferably one which indicated its restricted food habit.

Type and paratype specimens of above description in author's collection."

Genitalia. In addition to the above, styles short, narrowed distal fourth stout, curving laterad, inner margin convex to apex at outer margin. Aedeagus in lateral view directed dorsally, curved most sharply near base and with apex bent inward, membranous and slightly enlarged; two ventrolateral processes arising near base and extending along shaft to near apex, tips bent inwardly corresponding to apical bend in shaft, but definitely shorter. Pygofer twice longer than median width, posterior margin diagonal and consisting of a stout, straight, dorsally directed hook, free on outer third.

Specimens are at hand from the following regions: Kansas, Nebraska, Colorado, Utah, Minnesota, South Dakota, North Dakota, Montana, Oregon, Iowa, Wisconsin, and New York, as well as British Columbia and Manitoba, Canada.

Norvellina helenae Ball

(Plates XXIV, XXVII, XXIX; fig. 8)

Norvellina helenae Ball, E. D., Fla. Ent. XV, p. 3, 1931.

The original description follows:

"Resembling *chenopodii* Osb., but much smaller with the much heavier vermiculations somewhat obscuring the saddle. Length, 4-4.5 mm.

Vertex proportionally longer than in *chenopodii*, twice wider than long, slightly longer on middle than against eye. Elytra reticulate throughout so that the lighter areas bounding the saddle are coarsely reticulate instead of ivory as in *chenopodii*. Female segment with a broad angular median notch in the apex of which arises a straplike process as long as wide and slightly bifid at apex. In *chenopodii* the margin is only faintly indented either side the strap. Color brownish fulvous with a fulvous vertex and scutellum, a brown saddle set off by semireticulate ivory areas. Face and below sordid fulvous.

Holotype female and allotype male Sanford, Florida, June 17, 1926, and six paratypes from the same place at various dates all collected by W. E. Stone and the writer near Lake Helen. The writer has material from Florida, Texas, Missouri and Kentucky and is inclined to believe that this small species replaces *chenopodii* throughout the entire cotton belt."

Genitalia. As above, styles shorter than *chenopodii* and angulate on inner margin to apex on outer margin. Aedeagus in lateral view curving dorsally and ending apically in a short membranous inward beak; with a pair of ventrolateral processes arising near base and extending length of shaft, distal one-fifth twisted half around and flaring slightly in dorsal view. Pygofer about twice longer than median width, pigmented portion narrowed posteriorly toward ventral margin and ending in a slightly curved, dorsally directed hook, usually more slender but varying to the form of *chenopodii*.

Numerous specimens are at hand from the following states: Kansas, Texas, Missouri, Mississippi, Alabama, Florida, Virginia, New Mexico, and Colorado, and one specimen each from Iowa and South Dakota.

The above two species appear to be quite distinct at the extremes of their distribution, *e. g.*, *N. chenopodii* in northern United States and *N. helenae* in Florida and southeastern United States, and are markedly different in size, shape of vertex, shape of scutellum, degree of coloration and shape of aedeagus and last ventral segment of female. However, some specimens taken in Kansas and vicinity

show a definite convergence of characters, making them nearly indistinguishable externally, with even the genitalia of the males in near agreement in one or two structures. Typically, *N. chenopodii* is characterized by a curved aedeagus, in lateral view, a membranous apex bluntly rounded and with lateral processes lacking approximately a tenth of being as long as aedeagus, the tips of processes fitting closely to shaft. In *N. helenae* the aedeagus is similarly curved, but instead of being smoothly rounded at apex the tip has a short inward hook. In addition the lateral processes are as long as the aedeagus and instead of fitting snugly along shaft at tip the apical one-fifth flares outward. In general the genitalia of *N. helenae* are smaller than *N. chenopodii* and the styles comparatively shorter and with more angulate apices.

Specimens from Kansas and vicinity are usually distinct, but occasionally the two appear to merge in one or more characters. For example, the typically deep notch in the last ventral segment of *N. helenae* from which arises a slightly bifid strap is occasionally shortened to approach the shallow sinuations on either side of the median notch typical of *N. chenopodii*. Female specimens otherwise typically *N. chenopodii* sometimes have truncate ultimate segments closely approaching *N. helenae* in structure. In the males the commonest resemblance is found when the general appearance of styles and aedeagus are typically as in *N. helenae,* but the lateral processes of the aedeagus shortened as in *N. chenopodii*. In such cases the predominance of characters, both external and internal, have been those of *N. helenae,* so that usually the males have been classified as *N. helenae,* atypical. However, atypical females seem more numerous.

Two male specimens are at hand indicating new distribution records for *N. helenae,* one in the collection of E. W. Davis labeled Ames, Iowa, June 21, 1931, H. H. Knight, and a second in the Snow Entomological Collection labeled Redfield, S. Dak., July 20, 1937, R. H. Beamer.

Norvellina snowi (Ball)

(Plates XXIV, XXVII, XXIX; fig. 9)

Eutettix snowi Ball, E. D., Proc. Dav. Ac. Sc. Vii, p. 49, 1907.

The original description follows:

"Form and general appearance of *saucia,* nearly, much paler, pattern and color of *mildredae,* nearly, but lacking the black markings. White, with a very pale brownish-olive color pattern. Length, female, 4.75 mm., width 1.5 mm.

Vertex rather long, very slightly angled, disc almost flat, the margins thick, elevated, slightly acutely angled with front. Elytra rather short, venation regular, the apical cells short.

Color. Vertex pale creamy white, sometimes with six faint brown spots on anterior margin and traces of irrorations on the disc. Pronotum finely irrorate with pale olive, with a brownish cast. Elytra hyaline, with the pattern of *mildredae,* or *saucia,* nearly, very pale brown olive, the saddle fading out towards the costa, pattern covering the entire claval area except for a narrow ivory white margin along suture on anterior half. Saddle with the anterior margin sloping rapidly backwards and fading out before reaching costa, rather broadly connecting with the apical cloud inside the middle of the disc. Three or four points on outer margin of claval pattern, one on anterior edge of saddle, another at apex of clavus and a few against the third and fourth apical veinlets, brownish or fuscous.

Genitalia. Female segment with a posterior margin gently rounding, a pair of minute acute median teeth set off by a slight notch on either side.

Habitat. Described from three specimens from Douglass, Ariz., altitude 3,750 feet (F. H. Snow), one from Catal Springs, Ariz. (Barber and Schwarz, U. S. N. M.) and one from Cornell U. coll. labelled 'Ariz. Lot 34', all females."

Genitalia. As above, styles long, slightly bulged in center of narrowed distal portion, ending in slightly out-curved, rounding knob. Aedeagus in lateral view curved dorsally ending apically with short, membranous inward beak as in *N. helenae;* shaft roughened on outer margin of distal half and with a pair of ventrolateral processes arising broadly near base and tapering to near apex. Pygofer about half longer than median width with slender, incurved hook arising on posterior ventral margin, free portion extending dorsally about three-fourths width of pygofer.

Lectotype female, Douglass, Ariz., Alt., 3,750, August, F. H. Snow, in the collection of Doctor Ball, and allotype male described above, Patagonia, Ariz., August 21, 1935, R. H. Beamer, in the Snow Entomological Collection, here designated. Two cotypes from Douglass, Ariz., are at hand as well as specimens from Patagonia, Santa Rita Mts., and Tucson, Ariz.

Norvellina perelegantis (Ball)

(Plates XXIV, XXVII, XXIX; fig. 10)

Eutettix perelegantis, Ball, E. D., Can. Ent., XXXIII, p. 46, 1901.

Readily distinguished from *N. mildredae* (Ball) by fuscous apex of scutellum. The original description follows:

"Form and colour pattern of *mildredae,* slightly smaller and darker. Length, 5 mm.; width, 1.5 mm.

Vertex slightly more angular than in *mildredae,* distinctly longer on middle than against eye, transversely depressed; front narrower than in *mildredae,*

not rounding in to the clypeus. Pronotum not as convex, the posterior margin scarcely emarginate.

Colour. Vertex pale creamy, six equidistant, pale fulvous spots on margin, basal half sparsely irrorated with pale fulvous. Pronotum dirty white, heavily marked with black behind the eyes; a broad parallel margined stripe on either side the median line, olive brown. Scutellum brownish fuscous, irrorate with pale, a small spot at apex, a pair of larger quadrangular ones on lateral margins back of the suture, and a minute one at each basal angle, milk white. Elytra, colour and pattern as in *mildredae*. Face dirty white, spots on lorae as in the former species. Below fuscous and pale.

Genitalia. Utimate ventral segment of the female over twice the length of the penultimate, the posterior margin broadly rounding, the median fourth roundingly emarginate one-fourth the depth, with a stout median tooth often bidentate at the apex; male valve obtusely triangular, the apex roundingly truncate, trilobate; plates three times the length of the valve, long triangular, the apex acute, filamentous, margins with silky hairs.

Described from five females and one male from Salida, Ridgway and Durango, Colorado. Readily separated from *mildredae* by the colour pattern of the vertex, pronotum and scutellum, and the distinct female segment."

Genitalia. As above, aedeagus in lateral view slender and curved sharply at base, apex rounding on outer margin; two ventrolateral processes arising at base and extending nearly length of shaft, distal one-fourth resembling a spearhead. Pygofer broad, posterior hook arising near ventral margin and curving broadly, following rounded posterior margin of pygofer, free from base but partially under membranous margin.

Lectotype male, here designated from the cotype series and in the collection of Doctor Ball. Allotype female, Salida, Colo., July 24, 1900, designated in the Colorado State Agricultural College collection. Two other females of the cotype series and two females and one male specimen from Fort Collins, Colo., have also been examined, as well as one male, Fort Collins, described above, and other specimens from Poudre Canyon, Durango and two specimens labeled "Colo., Ball." Other localities represented include Utah, Oregon, and a pair taken at Indio, Cal., August 5, 1936, R. H. Beamer.

Norvellina mildredae (Ball)

(Plates XXIV, XXVII, XXIX; fig. 11)

Eutettix mildredae, Ball, E. D., Can. Ent., XXXIII, p. 45, 1901.

Closely resembling *N. perelegantis* (Ball), but easily distinguished by light-colored apical third of scutellum, as well as male pygofer hook. Females usually about 6.25 mm. in length and 2 mm. wide; males 5.5 mm. long and 1.75 mm. wide. The original description follows:

"Form and general appearance of *pulchella;* colour pattern of *scaber,* but with extra markings, and different colours on pronotum and elytra. Length, 5.5 mm.; width, 1.75 mm.

Vertex slightly angularly rounded, transversely depressed before the apex; front as in *scaber,* the margin between front and vertex more strongly produced. Pronotum slightly angularly rounding anteriorly, much more so than in *scaber;* lateral angles scarcely apparent, rounding from eye; pronotum and scutellum convex, elevated.

Colour. Vertex orange-yellow, paler at base; scutellum orange, the basal angles and the margins at apex irrorate with fuscous. Pronotum dirty white, some black spots next the eyes; disc irrorate, pale olive-brown, omitting an oval spot on the posterior disc on either side and the median line. Elytra milk white, with black margined areas of olive-brown, as follows: All of clavus except a semicircular spot at base and another at middle of claval suture; an oblique band on corium, beyond this spot narrowing to the costa. There are three pairs of black spots along the sutural margin of clavus, the apical pair largest. The claval suture between the white spots, and the anterior and costal margins of the oblique band, heavily black. Inner apical cells and a few spots on costa irrorate with black. Face orange, a black spot on outer angle of either lora. Below pale yellow and fuscous.

Genitalia. Ultimate ventral segment of the female about twice the length of the penultimate, the posterior margin broadly, slightly rounding, the median third produced in two rounding lobes; the notch between them not as deep as their length, the lobes usually black; male valve obtusely triangular, a little over half the length of the ultimate segment; plates long triangular, about three times the length of the valve, the apex attentuate, filamentous, together with the margin clothed with long silky hairs.

Described from three females from Colorado Springs, taken by the author, and fourteen examples of both sexes from Manitou, collected by Professor Van Duzee. This is one of the prettiest *Jassids* that I have ever seen, and I take pleasure in naming it after my wife, whose careful drawings will add much to the value of my future synoptic work."

Genitalia. As above with styles on distal portion median long, slightly convex on inner margin and tapering to an apical point near outer margin. Aedeagus in lateral view long, slender and terminating apically in slightly narrowed head; two ventrolateral processes arising near base and extending about length of shaft, apices sharp and bent toward shaft. Pygofer broad with long, stout, rather straight hook arising on posterior ventral margin and extending dorsally and backward at about a sixty degree angle with the plane of the ventral margin.

Lectotype female, Colorado Springs, here designated from the cotype series in Doctor Ball's collection. One cotype from Colorado Springs, in the collection of the Colorado State Agricultural College, examined as well as numerous specimens from Poudre Canyon, Colo.; Silver City, Las Vegas, Tucumcari, and Luna, N. Mex.; and Prescott and Yarnell, Ariz.

Norvellina mildredae var. *minuta* Lindsay

(Plates XXIV, XXVIII, XXIX; fig. 12)

Jour. Kan. Ent. Soc., Vol. 11, p. 114, 1938

Closely resembling *mildredae* in all respects except size and distribution. Small specimens, female 4.75 mm. long and male 4 mm.

Genitalia. Styles and aedeagus shaped as in *mildredae,* but about half as large. Pygofer about two-thirds as large as *mildredae.*

Holotype male, allotype female, and one male paratype from Ozona, Tex., July 9, 1936, R. H. Beamer. These miniature *mildredae* are so strikingly smaller than the true species as to warrant varietal ranking. In addition their habitat on the open, arid plains indicates that they are probably from a different host than the mountain *mildredae* taken on red cedar and, according to Ball, found only in sheltered situations.

Norvellina scaber (Osb. and Ball)

(Plates XXV, XXVIII, XXIX; fig. 13)

Eutettix scaber Osb. and Ball, Proc. Dav. Ac. Sc., VII, p. 96, 1898.

This large, robust species, although taken in well-collected territory, is represented only by four cotypes and one specimen, and therefore seems a rare form. The original description follows:

"Form of (*Eutettix*) *lurida,* dark, fulvous-brown above, with a large angular area on the outer base of the elytra. Length, female, 6.5 mm.; male, 6 mm. Width, 1.75 mm.

Vertex parallel-margined, over three times wider than long, transversely depressed back of the rounding margin, front broad, wedge-shaped, longer than in *lurida,* the clypeus hardly widened at the tip, genae with the outer margin rounding. Pronotum broad, convex, highest behind, the humeral margin straight, parallel with the margin of the scutellum. Elytra broad, only slightly overlapping behind, nervures indistinct.

Color. The vertex reddish-brown anteriorly with five white spots confluent with the margin, posteriorly with two white spots just before the margin slightly nearer each other than the eyes, face light yellow, a black spot against the outer margin of the lorae, pronotum and scutellum chestnut, finely irrorate, two white spots on the scutellum against the ends of the transverse depression and another at tip; elytra heavily irrorate, almost clouded with dark chestnut, except for the outer margin of the basal part of the clavus the entire basal half of the corium, and an indistinct transverse band just before tip strongest on the costal margin. The basal part of corium in hyaline yellowish, oblique behind, bordered above by a narrow white line on the margin of the clavus and extending forward across the lateral margin of the pronotum to the corner of the eye; below yellowish.

Genitalia. Female, ultimate ventral segment moderately long, lateral angles rounding, posterior margin slightly produced and feebly notched in the middle, pygofers much longer than in *lurida,* obscure yellowish with brown spots; male

valve rounding, plates triangular, twice the length of the valve, their margins clothed with long hairs.

Described from three females and one male, collected at Ames, Iowa; two of them swept from white oak."

Genitalia. As above, with distally narrowed portion of styles moderately long and bluntly pointed on apices. Aedeagus in lateral view curved sharply near base and extending dorsally with swollen hump on outer curve of shaft just prior to apex with short inward beak; a pair of ventrolateral processes arising basally and extending to near apex of shaft, curved at tip correspondingly with hump on shaft. Pygofer large and broad, not much longer than median width, and with hook arising on posterior-ventral corner inside the pygofer plate and projecting dorsally.

Doctor Ball (Proc. Dav. Ac. Sc., XII, p. 27, 1907) later considered this species as a variety of *pulchella,* and although there is a resemblance in pattern, all other characteristics indicate a distinct species. Curiously enough the internal genitalia here are about the size of most of the smaller species in the genus.

Lectotype male, allotype female, Ames, Iowa, here designated and in the Iowa State College collection. Two cotypes and one other specimen, all females, in the collection of Doctor Ball.

Norvellina flavida Lindsay

(Plates XXV, XXVIII, XXIX; fig. 14)

Jour. Kan. Ent. Soc., Vol. 11, p. 114, 1938

Closely resembling *N. pulchella* (Baker), but easily distinguished by the broadly suffused, canary yellow corium anterior to costal plaque, vertex not so produced and more rounding, with generally lighter markings on disc. Pygofer hook vestigial. Length of female, about 5 mm.; male, 4.75 mm.

Vertex scarcely produced at center in males, more distinctly in females with definite margin; only slightly arched behind transverse depression. Pronotum slightly arched in lateral view. Elytra long, overlapping.

Color. Front yellow streaked with brown, yellow extending slightly over margin of vertex. Vertex with four brown spots near anterior margin with a similar spot behind each ocellus usually connected to tawny-brown pattern behind transverse depression. Pronotum fuscous, omitting a sprinkling of light areas and irregular, yellowish lateral margins. Scutellum about like pronotum, slightly lighter. Elytra with median pattern composed of brown background covered with fuscous vermiculations extending over most of

clavus to apex, and spreading laterally to margin at costal plaque, omitting three pairs of small, round semihyaline areoles on mesal margin; elytron distal to clavus with lighter continuation of pattern to apex, mostly in third and fourth apical cells.

Genitalia. Female ultimate segment more than twice length of preceding, rounding posteriorly from lateral margins, slightly produced at center with median notch sinuate either side. Male plates long-triangular, acuminate at apices. Styles longer than usually on distally narrowed portion, rounding on inner margin. Aedeagus in lateral view sharply curved dorsally, tapering on distal half to dorsoventrally flared apex, about four times broader than shaft next apex; a pair of ventrolateral processes arising at base and tapering to a little past apex of shaft, more curved at tip. Pygofer almost triangular, hook vestigial.

Holotype male, allotype female, 18 miles N. W. Fort Stockton, Tex., July 11, 1936, R. H. Beamer. Paratypes from following localities: Eight males, four females, as above; four males, 47 mi. W. Sheffield, Tex., July 10, 1936; seven males, sixteen females, Rodeo, N. Mex., June 8, 1933; one male, one female, Sheffield, Tex., July 10, 1936; one male, one female, Las Cruces, N. Mex., July 1, 1932; one male and one female, Satillo Coahuila, Mexico, November 21, 1932; one female each from Santa Rita Mts., Arizona, July 17, 1932, and Davis Mts., Texas, June 2, 1937; and one male, Hope, N. Mex. Types and paratypes in Snow Entomological Collection. Paratypes in U. S. N. M. and collection of Mrs. J. N. Knull.

Norvellina pulchella (Baker)

(Plates XXV, XXVIII, XXIX; fig. 15)

Eutettix pulchella Baker, C. F., Psyche, VII, suppl. 1., p. 24, 1896.

With pattern and color as in *N. scaber* (Ball), but smaller, not so plump in appearance. Length of female, about 5 mm., male, 4.5 mm. Distinguished from all other species in the genus by two long, armlike, posteriorly directed hooks arising on each of the involute ventral margins of the pygofer.

Vertex short, broadly rounding, only slightly more produced at center than next eyes; transverse depression shallow, disc only slightly arched posteriorly. Pronotum slightly arched in lateral view, anterior margin more produced than posterior.

Color. Vertex yellowish on margin with four extensions of brown coloring on disc slightly anterior to transverse depression; reddish-brown coloring on posterior disc and pronotum, except for ivory

lateral margins omitting numerous irregular whitish spots. Scutellum similarly colored with three marginal white spots forming apical triangle, usually with four distinct spots on anterior disc and numerous small spots. Elytra with heavily vermiculate median pattern covering most of clavus to apex and extending laterally from distal third of clavus to costal plaque, with three hyaline equidistant spots on mesal margin, basal corium mostly hyaline to fumose; elytra beyond clavus coarsely vermiculate, heavier on third and fourth apical cells.

Genitalia. Female ultimate segment twice longer than preceding, rounding from sides to centrally produced posterior margin with small median tooth slightly bifid and notched at either side. Male valve obtusely angular, about three-fourths length of preceding segment, plates long-triangular, not attenuate. Styles on narrowed distal portion moderately long, extending diagonally laterad and slightly knobbed on apices. Aedeagus in lateral view short, shaft nearly straight, roughly toothed on outer margin with a pair of lateral processes arising near base and extending about three-fourths length of shaft. Pygofer broad, only slightly longer than median width, rounding posteriorly with long, armlike process arising on involute ventral margin and extending posteriorly nearly half of length beyond posterior pygofer.

Lectotype male, San Augustine, N. Mex. (Ckll. ?), deposited in the U. S. N. M. Allotype female, Hot Springs, N. Mex., July 21, 1936, R. H. Beamer and in the Snow Entomological Collection. Numerous specimens are at hand from Patagonia, Tucson, Mescal, Hereford, and Alamo, Ariz., and Hot Springs, N. Mex. As stated by Doctor Ball (Proc. Dav. Ac. Sc., XII, p. 51, 1907), this is a southern form and Baker's specimens from Fort Collins probably belong to the *saucia* group, since they are qualified in the original description.

Norvellina columbiana (Ball)

(Plates XXV, XXVIII, XXIX; fig. 16)

Eutettix columbiana Ball, E. D., Can. Ent., XLVIII, p. 125, 1916.

The original description of the male follows:

"Resembling *perelegantis* and *mildredae,* but lighter in colour and lacking the definite shades of orange and olive. Form of *saucia* nearly. Length, male, 5 mm.

Vertex roundingly right-angled, the apex blunt, disc slightly sloping, depressed before the margin. Pronotum as in *saucia,* lacking the definite gibbous appearance of *perelegantis.* Venation as in *saucia.*

Colour ivory white, with a pale, tawny and olive-brown saddle with black

points. Vertex creamy, with traces of four brown points on the margin, a pair of rather large irregular spots on the posterior submargin a little more than their own width from the eyes. Face and below creamy. Pronotum ivory, mottled with olive and brown, omitting the lateral and most of the anterior margin; two definite black spots behind the inner angle of either eye and two irregular ones nearer the median line. Scutellum creamy, the lateral angles olive brown. Elytra ivory subhyaline, with an olive-brown saddle as in *saucia*, but lighter or wanting along the sutures, and with three definite, dark points extending almost to the claval suture, apical cloud reduced to spots on third and fourth nervures.

Genitalia of male as in *saucia*.

Described from two males from Wenatchee, Washington, collected by the writer. From *saucia* this species can be separated by the definite black spots on the pronotum, from *percelegantis* by the structure of head and pronotum."

The above description of color modified to fumose, with a light-brown saddle irrorate with brown, since the majority of specimens at hand are darker than the two cotypes. The females closely resemble the males, slightly larger, 6.75 mm. long.

Genitalia. Ultimate segment of female about three times longer than preceding, rounding gently at sides, nearly truncate on posterior margin with median notch. Posterior margin, except at center, widely membranous. Male valve short, obtuse; plates moderately long-triangular, nearly acuminate at apices. Aedeagus in lateral view long, curving dorsally more sharply at a point about one-third length of shaft, apex rounding on outer margin with short inward beak; a pair of ventrolateral processes arising basally and extending broadly to near apices where they narrow to a point even with apex of shaft. Pygofer broad, little longer than median width; a thickened hook attached along posterior border, free portion about one-third total length and directed dorsally.

Lectotype male, Wenatchee, Wash., August 18, 1912, designated in the collection of Doctor Ball. Allotype female, Pasco, Wash., July 8, 1935, Oman, here designated and in the U. S. N. M. Three males and one additional female from the latter locality have been examined.

Norvellina vermiculata Lindsay

(Plates XXV, XXVIII, XXIX; fig. 17)

Jour. Kan. Ent. Soc., Vol. 11, p. 115, 1938

Closely resembling *N. saucia* (Ball), but with median pattern lighter and composed of coarsely reticulate vermiculations over a light background; veins on corium dark and interspersed with light vermiculations. Length, about 4.75 mm.

Vertex obtusely angulate in females, distinctly more produced at center than next eyes; males more rounding.

Color. Vertex with four irregular brown spots near anterior margin and one behind each ocellus on ivory to cream-colored background; discs posterior to transverse depression usually vermiculate with brown. Pronotum vermiculate with brown except for light areas along anterior and lateral margins and on disc so that there often appears to be longitudinal light lines on pronotum. Scutellum tawny to brown omitting numerous light spots. Elytra as above, apices sparsely vermiculate.

Genitalia. Ultimate female segment twice longer than preceding, sloping inward on posterior half of lateral margins; posterior margin truncate with short, slightly bifid, wedge-shaped median tooth, shallowly notched at either side. Male valve obtuse, over half length of preceding segment; plates triangular, about twice as long as basal width, slightly attenuate at apices. Aedeagus in lateral view short, curved dorsally, rounding on outer margin near apex, slightly constricted to apical head bluntly pointed on inner margin; a pair of ventrolateral processes. Pygofer twice longer than median width, narrowed posteriorly with hook attached on posterior margin, free portion extending dorsally half the length of hook.

Holotype male, allotype female, and four male paratypes, Berger, Idaho, June 15, 1931, Wind vane trap. Other paratypes as follows: Two males, Hansen, Idaho, June 22, 1931; five males, Hollister, Idaho, June 22, 1931; two females, Promontory, Utah, August 6, 1930, on Atriplex, G. F. Knowlton, collector; two males, Murtaugh, Idaho, June 23, 1931; one female each from Wendell, Idaho, June 14, 1934, *A. tridentata*, and Haberman, Idaho, Blue Gulch, September 4, 1932; and one male each from Burley, Idaho, June 23, 1931; Jerome, Idaho, July 8, 1932; Castleford, Idaho, July 11, 1932; and Maybell, Colo., June 30, 1931, R. H. Beamer. Types and paratypes in U. S. N. M. and paratypes in Snow Entomological Collection.

Norvellina varia Lindsay

(Plates XXV, XXVIII, XXX; fig. 18)

Jour. Kan. Ent. Soc., Vol. 11, p. 116, 1939

Closely resembling *N. saucia* (Ball), but with the pronotum more heavily infuscate and the general color pattern more reddish-brown. Length, females about 5 mm.; males, 4.75 mm.

Vertex distinctly more produced at center than next the eyes, transverse depression usually distinct, posterior disc slightly inclined in lateral view. Pronotum moderately arched in lateral view. Elytra relatively narrow; specimens in dorsal view not appearing as plump as in *saucia*.

Color. Vertex with four elongate, light-brown spots near anterior margin with a similar spot behind each ocellus; posterior to transverse depression usually sparsely vermiculate with tawny brown on ivory background. Pronotum heavily infuscate except for narrow lateral margins and omitting numerous light spots, especially on anterior margin between the eyes. Scutellum with triangular reddish areas on lateral corners, the center more brown and the two colors separated by linear light spots. Elytra with median pattern as in *saucia*, but darker, composed of tawny-brown background heavily irrorate with mahogany; distal portion sparsely vermiculate with fuscous over anteapical cells, more heavily on third and fourth apical cells.

Genitalia. Ultimate female segment about twice length of preceding, posterior margin gently rounding with a very short tooth either side of a shallow median notch, slightly sinuate at either side. Male valve obtuse; plates long-triangular, nearly acuminate on distal half. Aedeagus in lateral view stout, curved dorsally on basal half, distal half nearly straight and ending in bluntly rounded apex; two slender ventrolateral processes arising at base and extending slightly beyond apex, mostly free of shaft. Pygofer broad, sloping distally toward dorsally extended hook arising on posterior margin and with free portion about equal to posterior width of pygofer.

Holotype male, allotype female, Pasadena, Cal., July 31, 1912, E. D. Ball; one male paratype, Pasadena, Cal., April 23, 1908; four female paratypes, Ontario, Cal., June 14, 1931, E. D. Ball. Types and paratypes in Doctor Ball's collection and paratypes in Snow Entomological Collection. Other specimens are at hand from Three Rivers, Pine Valley, San Jacinto Mts., Campo, San Gabriel Canyon, and Colfax, Cal., and Cisco, Utah, but all showing slight variations and for this reason are not included in the paratype series. The apparent tendency of this form to vary in shape of and markings on vertex, while genital structures remain constant, accounts for its specific name.

Norvellina saucia (Ball)

(Plates XXV, XXVIII, XXX; fig. 19)

Eutettix saucia Ball, E. D., Can. Ent. XXXIII, p. 46, 1901.

The original description follows:

"Form and general appearance of *scaber,* smaller and paler, the vertex mostly pale. Length, 4.5 mm.; width, 1.5 mm.

Vertex longer, narrower and more angulated than in *scaber;* face narrower above, longer than its basal width, rounding to the clypeus. The pronotum broadly and evenly rounding in front, truncate behind, almost twice the length of the vertex.

Colour. Vertex pale yellow, six minute points on anterior margin and three irregular irrorate patches on posterior margin brownish fuscous. Pronotum white, coarsely irrorate with dull brown except a narrow lateral margin and traces of three pale lines. Scutellum more finely irrorate, three ivory white points in a triangle beyond the transverse line. Elytra milky white, closely and finely irrorate with dull brown, as follows: All of clavus except a narrow strip along basal two-thirds of claval suture, once or twice interrupted and broadened at the end; a rather narrow oblique strip across corium beyond this and some irregular markings towards the apex, which form two definite spots on the costa. Two pairs of pale spots along the sutural margin of clavus. Fale pale yellow, below, pale and fuscous.

Genitalia. Ultimate ventral segment of the female nearly twice longer than penultimate, the posterior margin nearly truncate from the rounding angles, with two triangular, slightly protruding median teeth; male valve very obtusely triangular; plates long triangular, their apices attenuate, black clothed with fine silky hair.

Described from a pair from Denver, a male from Fort Collins, Colo., and another from Tucson, Ariz. This species is closely allied to *scaber,* from which the longer vertex, smaller form, lighter color and absence of distinct band on vertex will easily distinguish it."

Genitalia. As above, but in addition with aedeagus in lateral view long and evenly curved dorsally, ending apically with an inwardly directed, fingerlike process; two ventrolateral processes arising near base and extending broadly to near apex of shaft. Pygofer a little longer than median width, sloping distally to a stout, nearly straight hook attached on posterior margin and extending dorsally, free on distal third.

Lectotype female, allotype male, Denver, Colo., September 7, 1898, here designated, the lectotype in Doctor Ball's collection and the allotype in the Colorado State Agricultural College collection. The remaining two cotypes have been examined and the one from Arizona proved to be *N. snowi* (Ball), described at a later date. Eight additional specimens are at hand: One female, Fort Collins, Colo., August 29, 1902; one male, Greeley, Colo., August 5, 1901; one female, Buena Vista, Colo., September 19, 1901; and five males, Colorado, two 2158, two 1596, and one 2121, collection of C. F. Baker, and in the U. S. N. M.

Norvellina numerosa Lindsay

(Plates XXVI, XXVIII, XXX; fig. 20)

Jour. Kan. Ent. Soc., Vol. 11, p. 117, 1938

Closely resembling *N. saucia* (Ball) externally, but usually darker on median pattern with lateral margins irregularly bordered with dark fuscous and aedeagus in lateral view, short and thick, more evenly curved and with processes much longer than shaft. Length of female, about 5 mm.; males, 4.75.

Vertex obtusely angulate on anterior margin; in lateral view with shallow, transverse depression and posterior disc slightly inclined. Pronotum, in lateral view, scarcely arched. Elytra moderately broad giving specimens stout appearance.

Color. Vertex pale ivory or whitish with four very small, brown dots on anterior margin and a similar dot, usually elongate, behind each ocellus; with sparse, sometimes indistinct, vermiculations back of transverse furrow. Pronotum light along lateral margins and in irregular patches on anterior margin, the remainder vermiculate with brown, distinctly or lightly, usually appearing trilineate longitudinally with fumose white. Elytra as in *saucia,* but darker, usually fringed with irregular fuscous border.

Genitalia. Ultimate female segment twice length of preceding, rounding on posterior margin with a distinct median notch and a smaller notch on either side. Male valve obtuse, plates long-triangular, slightly attenuate. Aedeagus in lateral view much as in *N. varia,* but shorter and thicker, with ventrolateral process extending about one-sixth beyond apex of shaft. Pygofer a little longer than median width with a slender, straight hook broadly attached on posterior margin at an angle of about forty-five degrees with the extended plane of the ventral margin.

Holotype male, allotype female, one male and two female paratypes, Prescott, Ariz., July 29, 1933, R. H. Beamer. Numerous other paratypes from the following localities: Prescott, Yarnell Heights, Yarnell, Superior, Oracle, Tucson, Williams, Granite Dell, Yavapai county, Congress Junction, and Glenn Oaks, Arizona; San Jacinto Mountains, Tehachapi, Orange county, Laguna Mountains, Doyle, Mojave, Chilcoot, Newton, Los Angeles county, and Fresno, California; Silver City, New Mexico; Las Vegas, Nina, Alamo, Wells, and Glendale, Nevada; Pintura, St. George, Modena, and Granite, Utah. Types and paratypes in Snow Entomological Collection; additional paratypes in Doctor Ball's collection and in U. S. N. M.

This species and the three preceding species make up a closely related group, which, for convenience, might be called the *saucia* group, since all the above species have at various times been placed in with *N. saucia* (Ball) due to a lack of stable and distinguishing characters. Only with the use of male genitalia is definite separation possible, since external appearances intergrade promiscuously, sometimes with one combination of characters and sometimes with another, but in the main as described. In selecting types the author chose those specimens possessing the largest number of stable ex-

ternal characters in hopes that the majority of specimens in this group can be thus keyed out. By far the larger number of specimens heretofore classified as *N. saucia* (Ball) belong in this latter species and suggested the specific name.

Norvellina rubida (Ball)

(Plates XXVI, XXVIII, XXX; fig. 21)

Eutettix rubida Ball, E. D., Can. Ent. XLVIII, p. 126, 1916.

The original description follows:

"Form of *pannosa* nearly. Shorter and broader with short apical cells. Colour and pattern of *saucia* nearly. Length: Female, 4 mm.

Vertex and pronotum nearly flat as in *pannosa*. Vertex broader than in that species and equally long, the apex slightly obtusely angled. Whole margin inclined to be thin and slightly upturned before the depression. Elytra very broad and short. Venation similar to *saucia*, except that the apical cells are only one-half as long. The central apical cell equally broad and long.

Colour red-brown and ivory. Vertex testaceous, the margins, ivory, with four large nearly quadrangular spots before the depression. Pronotum densely mottled with rusty brown, omitting the lateral margins. Scutellum rusty brown. Elytra ivory, with a dark, rusty-brown saddle of the *saucia* pattern, the line next the claval suture nearly straight and not dark margined, the apical cells densely clouded.

Genitalia. Female segment moderately long, nearly truncate, with a broad, short, bilobed projection.

Described from a single female taken by the writer in Logan Canyon, Utah; altitude, 6,000 feet. This is a strikingly distinct species, in the broad short form, short apical cells and long flat vertex."

Male. Structure and coloration about the same, only slightly narrower. Length of each sex about 4 mm.

Genitalia. Female as above. Male valve short, obtuse; plates long-triangular, about twice longer than basal width, not acuminate. Aedeagus in lateral view long, curved dorsally and with a blunt triangular process on inner margin at apex, nearly avicephaliform; Two ventrolateral processes arising near base and extending length of shaft, bent sharply inward to a point at apices to correspond to inward process of aedeagus. Pygofer a little longer than broad, rounding apically to a short hook on posterior margin directed dorsally and with distal one-fourth free of attachment to pygofer.

Lectotype female, Logan Canyon, Utah, altitude 6,000 feet, E. D. Ball and in Doctor Ball's collection; allotype male, Yellowstone Park, Wyo., July 20-25, 1920, A. A. Nichol, and in the Snow Entomological Collection. Study based on a female metatype, Grand Teton National Park, August 18, 1931, R. H. Beamer. In addition, one male, Yellowstone Park, Wyo., July 20-25, 1920, A. A. Nichol,

and one female, Brighton, Utah, September 1, 1933, Davis and Dorst, have been determined by the author as this species. The two males, holotype and paratype, of *N. oregona* Ball (Fla. Ent., XV, p. 3, 1931), have been carefully examined, and although they are very slightly smaller in all respects they are considered by the author as synonyms of *N. rubida* (Ball).

Norvellina excavata Lindsay

(Plates XXVI XXVIII, XXX; fig. 22)

Jour. Kan. Ent. Soc., Vol. 11, p. 119, 1938

Closely resembling *N. pulchella* (Baker), but with infuscated area on posterior disc of vertex not extending to transverse furrow, the anterior margin of this area with small, rounded excavations each side of median line and conspicuously separated from dots near anterior margin of vertex. Length, about 5 mm.

Vertex rounding to front, more produced at center than next the eyes; transverse depression very shallow, disc slightly inclined posteriorly.

Color. Vertex ivory to tan with four very small brown spots on anterior edge of transverse furrow and a slightly elongate spot behind each ocellus; approximately the basal half of vertex with brown to fuscous pattern omitting irregular, small, whitish spots; anterior margin of pattern with a small, rounded indentation either side of median line. Dorsum of species with typical saddle markings.

Genitalia. Ultimate female segment about twice length of preceding, posterior third of lateral margins rounding posteriorly and nearly straight across on posterior margin, with a slightly bifid, median projection notched on either side about half the length of the projection. Male valve obtuse, plates long-triangular, over twice the length of basal width. Aedeagus in lateral view of medium length, curving dorsally with sharply incurved, bluntly rounding apex; two ventrolateral processes arising near base and extending about five-sixths the length of shaft, the distal one-third somewhat spear-headed, with tips turning slightly outward from shaft. Pygofer narrowing sharply on distal half with a long, stout hook extending dorsally and back at about an angle of thirty degrees with the plane of the ventral margin.

Holotype male, allotype female, Valentine, Tex., July 13, 1927, R. H. Beamer, and paratypes as follows: One male, Ozona, Tex., July 9, 1936, R. H. Beamer; one female, Hidalgo county, Texas, July 28, 1928, A. M. James; one female, Davis Mts., Tex., June 2, 1937, D. J. and J. N. Knull; and one male, Uvalde, Tex., Aug. 4,

1937, D. J. and J. N. Knull. Types and paratypes are in the Snow Entomological Collection, and paratypes in the collection of Mrs. J. N. Knull.

Norvellina rostrata Lindsay

(Plates XXVI, XXVIII, XXX; fig. 23)

Jour. Kan. Ent. Soc., Vol. 11, p. 120, 1938

Resembling *N. varia* n. sp., but usually a little darker on median pattern, vertex more angulate and produced at center, transverse depression indistinct, and aedeagus in lateral view broad and beaklike in appearance. Length of male, 5 mm.; female, 5.5 mm.

Vertex angulate from dorsal view, in lateral view margin rounded but distinct, with only a suggestion of a transverse furrow and sloping upward from anterior to posterior margin. Pronotum moderately arched in lateral view. Elytra long and narrow.

Color. Vertex mostly brown, omitting whitish to ivory areas along anterior margin and in irregular patches on disc; customary spots along anterior margin modified to more or less indistinct extensions of brown pattern. Pronotum brown on median portion, shading to fuscous on lateral thirds excluding an irregular, light lateral margin and numerous light spots sometimes fused. Scutellum brown to fuscous omitting numerous light spots and a light ivory, triangular spot at each end of transverse suture. Elytra with typical saddle pattern light, margin of basal clavus along claval suture opaque white, basal corium mostly hyaline, allowing yellow wall of abdomen to show through distinctly; elytra beyond clavus semihyaline covered with fuscous vermiculations, sparse near clavus but heavier in extremes of third and fourth apical cells, omitting a hyaline area along the median margin in the fourth.

Genitalia. Ultimate segment of female at least twice the length of the preceding segment, rounding strongly on lateral margins; posterior margin strongly produced to a small median notch, sinuate on either side. Male valve obtusely rounding; plates long-triangular, outer margins broadly indented about one-third distance to apices. Aedeagus in lateral view appearing broad and beaklike, width about one-third of length; width due to a thin, membranous, keel-like extension on outer margin; base thickened dorsoventrally with a pair of processes arising on outer margin and extending along outer edge of membrane to apex of shaft. Pygofer less than twice length of median width, broadly rounded posteriorly with an irregular hook curved along posterior margin.

Holotype male, allotype female, and two paratypes, male and female, Lucerne, Cal., July 17, 1935, R. H. and Jack Beamer. Types and paratypes are in the Snow Entomological Collection.

Norvellina pannosa (Ball)

(Plates XXVI, XXVIII, XXX; fig. 24)

Eutettix pannosa Ball, E. D., Can. Ent. XXIV, p. 12, 1902.

The original description follows:

"Resembling *saucia* and *scaber* in general appearance, smaller, darker, and with longer vertex and more generally reticulate elytra. Length: female, 4.5 mm.; male, 4 mm. Width: female, 1.5 mm.; male, 1.25 mm.

Vertex right angled, apex blunt, three-fifths as long as its basal width, two-thirds as long as the pronotum, half longer on middle than against eye, disc slightly sloping, flat, with the apex elevated. Face retreating, forming an acute angle with the vertex, front rather broad. Elytra rather short, compressed at the apex, venation weak, irregularly reticulate, the second cross nervure sometimes present.

Colour. Vertex and pronotum pale cinereous or milky, heavily and very evenly irrorate with brownish fuscous, except that the anterior margin of the vertex presents six more or less definite dark spots, and the lateral margin of the pronotum is narrowly lined with ivory white. Elytra with the inner halves resembling the pronotum in colour, the outer half on either side milk white, with more or less of brownish reticulation, especially along the costal margin. The brown area on the disc being heaviest along the margin, and shading out towards the suture, the milk-white area being continuous with that on the margin of the pronotum and including the claval suture to just before the middle, when it narrows down obliquely to one-half the former width, and becomes obscured by the heavier reticulation toward the tip. Face closely and evenly irrorate with fuscous.

Genitalia. Female segment twice the length of the preceding posterior margin, rounding with a rather broad, blunt, slightly bilobed median projection, surface of the segment depressed either side of this tooth; male valve triangular, narrower than the ultimate segment, and about two-thirds its length; plates long, triangular, apices acute, three times the length of the valve.

Described from eight specimens from the National Museum collection 'Los Angeles county, California, Coquillett collector.'"

Genitalia. In addition to the above the male styles, on narrowed distal portion, are slightly swollen near the middle of the outer margin, apices blunt. Aedeagus in lateral view slender, curving dorsally with a slightly bulbous apex; two flattened lateral processes arising near base and extending about one-fifth beyond shaft. Pygofer relatively broad, posterior margin angulate with a slender, tapering hook slightly curved near apex arising near ventral margin and extending dorsally and back nearly the width of the posterior margin and at an angle of about forty-five degrees with the plane of the ventral margin.

Numerous specimens are at hand from the following localities: Big Bear Lake, Orange county, Alpine, San Diego county, Laguna Beach, Campo, Beaumont, Claremont, San Jacinto Mts., Mint Canyon, Lockwood, Nipomo, Monrovia, Sunset Beach, Mohave, Tehachapi, and Cajon Pass, California; and Miami, Ariz.

Norvellina curvata Lindsay

(Plates XXVI, XXVIII, XXX; fig. 25)

Jour. Kan. Ent. Soc., Vol. 11, p. 121, 1938

Resembling *N. pullata* (Ball), but darker and with median pattern extending uniformly from base to apex of clavus and composed of fuscous irrorations and vermiculations. Length of male, about 5.25 mm.; female, about the same length but broader.

Vertex obtusely angulate on anterior margin, in lateral view margin definite, transverse depression shallow, disc inclined posteriorly. Pronotum only slightly arched in lateral view. Scutellum slightly inflated at apex. Elytra of moderate width.

Color. Vertex with whitish to fumose background upon which are four rather large, irregular, light-brown spots near anterior margin and a smaller spot behind each ocellus; remainder of disc brown vermiculate over lighter background. Pronotum reticulate with brown or fuscous, omitting a whitish line on each lateral margin and numerous fumose to whitish areas on disc. Scutellum more heavily reticulate, usually with lateral corners and all but extreme apex of apical corner darker and with a roughly triangular light spot at each end of the transverse suture. Elytra with *Norvellina* type median pattern, composed of fuscous irrorations and vermiculations, heaviest on lateral margins and extending to claval suture on clavus; elytra posterior to clavus sparsely vermiculate, heavier in apices of second and third anteapical cells and third and fourth apical cells.

Genitalia. Ultimate female segment round to angulate on lateral-posterior corners, posterior margin truncate with a slight bifid median projection. Male valve obtusely rounding; plates long-triangular, slightly acuminate at tip. Aedeagus in lateral view long, sharply curved dorsally near middle, apex rounding on outer margin to short inward tooth on inner margin; two lateral processes arising basally and extending very nearly to apex, closely appressed to shaft. Pygofer large, rounding posteriorly on inner margin to a strong hook attached on posterior margin and directed dorsally, free portion as long as posterior width of pygofer.

Holotype male, allotype female, one male and two female para-

types, Grand Teton National Park, August 18, 1931, R. H. Beamer. Types and paratypes are in the Snow Entomological Collection.

Norvellina nevada (Ball)

Eutettix nevada Ball, E. D., Can. Ent., XLVIII, p. 126, 1916.

The original description follows:

"Form of *saucia* nearly, with a similar saddle. Colour of *texana* or a pale *pannosa*. Length, female, 4.6 mm.

Vertex similar to *saucia*, slightly less sloping, pronotum very flat, much less arched than in *saucia*. Front very full, roundingly right angled with vertex. Venation as in *pannosa*.

Colour creamy white, mottled and washed with pale olive-brown. Vertex creamy, traces of four brown spots on anterior submargin, three large, slightly irregular mottled areas along the posterior margin, the median one nearly circular. Pronotum mottled with pale brown, omitting the lateral margins and three narrow stripes on the disc. Scutellum mottled with pale brown, with two stripes. Elytra milky with the saddle of a pale mottled brown, omitting an irregular sutural stripe. The ivory margin along the claval suture is narrow and regular as in *pannosa*, without the posterior enlargement, as in *scitula*, and without the usual distinct dark margins. The saddle extends to costa, but the apical cloud is reduced to a few reticulations. A number of strong reticulations on basal area of the corium below the saddle.

Genitalia. Female segment rather long, slightly rounding posteriorly, with a slight, rather broad strap-shaped projection, which is dark-lined back on to the segment.

Described from a single female collected at Wells, Nevada, by the writer. The short head will separate this species from *pannosa*, while the strongly margined saddle renders it quite distinct from *saucia*. Its mottled appearance suggests *texana*, but that species does not have a saddle."

Color. The type of the above description is obviously faded, and from two subsequent specimens it is found that the coloring of the vertex, pronotum and scutellum is mostly brown on a cream to whitish background, while the elytra are marked as above, but with brown fuscous.

Genitalia. Female as above. Male value obtuse; plates long-triangular, slightly attenuate. Styles on narrowed distal portion rounding on inner margins to blunt apices. Aedeagus similar to *N. apachana*, in lateral view thickened basally curving sharply dorsally, apex rounding on outer margin and projecting bluntly inward on inner margin; a pair of ventrolateral processes arising basally and extending to near apex, tips bent slightly inward. Pygofer narrowed on posterior half to a stout hook arising on posterior margin and extending dorsally nearly the width of the base.

Lectotype female, Wells, Nev., July 20, 1912, E. D. Ball; allotype male, Redmond, Ore., July 12, 1927, and both in the collection of Doctor Ball. One female, Walden, Colo., August 20, 1931, R. H. Beamer, has been compared with the type by this writer and found to be essentially the same except for darker coloration, being about the color of the above male determined by Doctor Ball. Since the lectotype appears either faded or teneral it is safe to assume that this species is typically as dark as *saucia*.

Norvellina clarivida (Van D.)

(Plates XXVI, XXVIII, XXX; fig. 27)

Eutettix clarivida Van Duzee, E. P., Can. Ent., XXVI, p. 138, 1894.

The original description follows:

"Form nearly of *Eutettix seminuda*. Pale greenish-yellow, anterior edge of the vertex with a distant pair of large, black spots and two brown points at the apex. Length, 4½ to 5 mm.

Vertex hardly one-fourth longer on the middle than next the eye, just one-half the length of the pronotum; marked with an impressed median line on the base, either side of which is the usual impressed area near the outer angle of the disc, and anteriorly is the transverse subapical depression common to this species of this genus. Front one-fourth longer than wide, clypeus scarcely expanded apically; cheeks as in *seminuda*. Valve of the male broad-triangular, about the length of the last ventral segment; plates about twice the length of the valve, their outer edges distinctly arquated near the base, pygofers exceedings the plates, obtuse. Ultimate ventral segment of the female rather long, hind edge rounded with a short, abrupt median projection or tooth, about twice as broad as long; pygofers broad, a little surpassed by the stout oviduct.

Colour. Entire insect pale greenish-yellow, polished, paler on the head and beneath, tips of the tarsal joints embrowned, extreme apex of the rostrum black, anterior edge of the head with a round, black spot placed just above and within each ocellus, and two minute equidistant brown points between these on the apex. Mesonotum and sometimes the basal tergal segments black. Eyes brownish. Elytra subhyaline with strong yellowish servures.

Colorado. Described from two male and four female examples received from Prof. C. P. Gillette. Except in its want of ornamentation this insect is closely related to *Eutettix seminuda*, Say, like which it approaches *Thamnotettix* in many of its characters. But its broader form, the characters of the vertex and the wide front will indicate its relationship."

Genitalia. In addition to the above the posterior margin of the ultimate female segment is sinuate either side of the slightly bifid median tooth. Aedeagus in lateral view curved dorsally with blunt, inwardly projecting apex; two ventrolateral processes arising basally and extending to near apex, tips slightly involute on inner margins. Pygofer broad posteriorly with a fragile hook arising on margin and extending dorsally slightly beyond attachment.

Good series of specimens are at hand from Green River and Grand Junction, Colo.; Richfield, Glenwood, Price, Thompson, Milford, Rosett, Grantville, Salt Lake, Cedar City, and Wellington, Utah.

Norvellina glauca Lindsay

(Plates XXVI, XXVIII, XXX; fig. 28)

Jour. Kan. Ent. Soc., Vol. 11, p. 122, 1938

Resembling *N. clarivida* (Van D.), but barely tinged with green, with a longer vertex and with spots near anterior margin minute and light brown. Length of male, 4.5 mm.; female, 5.25 mm.

Vertex angulate, posterior margin rounding, considerably more produced at center than next eyes; in lateral view anterior margin rather sharp, transverse depression broad, in female disc nearly concave. Pronotum short, rounding to front, nearly truncate behind. Elytra moderately long.

Color. General color grayish white slightly tinged with green. Vertex whitish to pale ivory with four small light-brown spots near anterior margin, sometimes a faint spot behind each ocellus. Pronotum mottled whitish to ivory, occasional faint brown spots on disc, usually behind the eyes. Scutellum about the color of the vertex. Elytra whitish sprinkled with light brownish to tan vermiculations, obscurely in the *Norvellina* pattern, slightly more definite on costal and apical margins.

Genitalia. Ultimate female segment about twice length of preceding, gently rounding posteriorly on lateral margins; posterior margin sinuate, produced at center into a long, slightly wedge-shaped projection notched at apex. Male valve roundingly obtuse, plates long-triangular, nearly acuminate apically. Styles on narrowed distal portion short angulate at apex to point on outer margin. Aedeagus in lateral view curving dorsally with inwardly pointing, avicephaliform apex; two broad lateral processes arising at base and extending the length of shaft, apices constricted to inwardly bent point. Pygofer less than twice length of median width, tapering toward a dorsally projecting, fragile hook attached to posterior margin.

Holotype male, allotype female, and two paratypes, male and female, Cuyama Ranch, Cal., July 25, 1935, R. H. Beamer. Types and paratypes in the Snow Entomological Collection.

Norvellina texana (Ball)

(Plates XXVI, XXVIII, XXX; fig. 29)

Eutettix texana Ball, E. D., Proc. Dav. Ac. Sc., XII, p. 52, 1907.

The original description follows:

"Form of *strobi* or *seminuda*, nearly, but entirely lacking their color pattern resembling *albida*, but pale creamy yellow, entirely covered by coarse reticulations of very pale rusty brown. Length: Female, 4.6 mm.; male, 4.8 mm.; width, 1.6 mm.

Vertex nearly as in *strobi*, a trifle angled before, disc slightly sloping, in the same plane as pronotum, transverse depression shallow, acutely angled with the front. Elytra as in *strobi*, venation regular but very much obscured by the reticulations.

Color. Pale creamy yellow, coarsely and rather evenly reticulate with pale rusty brown, often wanting on the vertex. Pronotum and elytra often with a few scattered ivory white dots, face and below pale. Sometimes the reticulation becomes so pale as to be scarcely visible.

Genitalia. Female segment with the posterior margin truncate or slightly rounding, median fourth excavated either side of two rounding approximate lobes that equal or slightly exceed the margins. Male valve very short, obtuse, plates long-triangular, acutely pointed.

Habitat. Described from five females and two males from Brownsville, Texas (Snow), and Victoria, Texas (U. S. N. M.), easily distinguished from the other pale forms by the saffron color and absence of definite pattern."

Genitalia. In addition to the above, aedeagus in lateral view resembling *helenae*, but shorter and with inward apical hook less pronounced; two ventrolateral processes arising basally and extending to near apex, narrowed distally. Pygofer tapering to a stout hook on posterior margin, free portion directed dorsally and about half the apical width of pygofer.

Lectotype female, allotype male, Brownsville, Tex., June, F. H. Snow, and in Snow Entomological Collection; other specimens are at hand from the following localities: Palopinto county, Hidalgo county, Cameron county, Brooks county, Menard county, Jackson county, San Juan, and Seymour, Texas; Douglas county, Wichita county, Logan county, and Medora, Kan.; and Grady, N. Mex.

PLATE XXIII

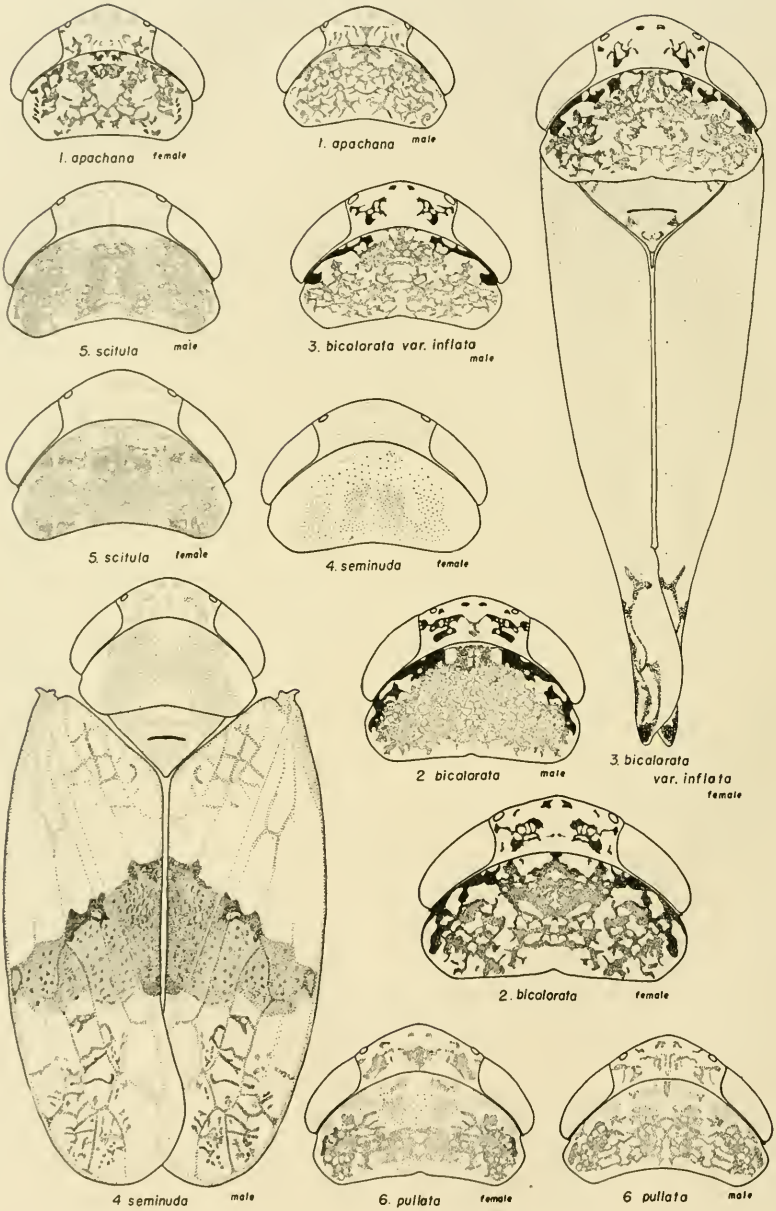

1. apachana female
1. apachana male
5. scitula male
3. bicolorata var. inflata male
5. scitula female
4. seminuda female
3. bicolorata var. inflata female
2. bicolorata male
4 seminuda male
2. bicolorata female
6. pullata female
6 pullata male

PLATE XXIV

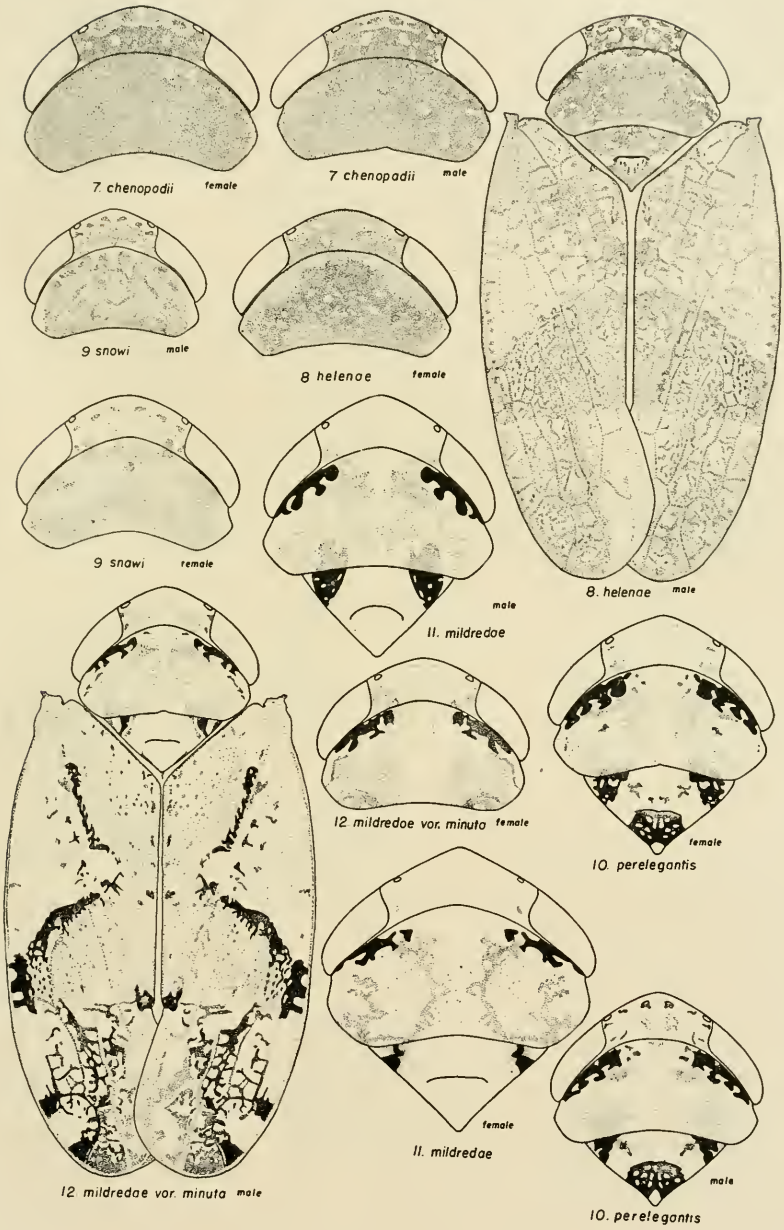

7 chenopodii female
7 chenopodii male
9 snowi male
8 helenae female
9 snowi female
11. mildredae male
8. helenae male
12 mildredae vor. minuta female
10. perelegantis female
12 mildredae vor. minuta male
11. mildredae female
10. perelegantis male

PLATE XXV

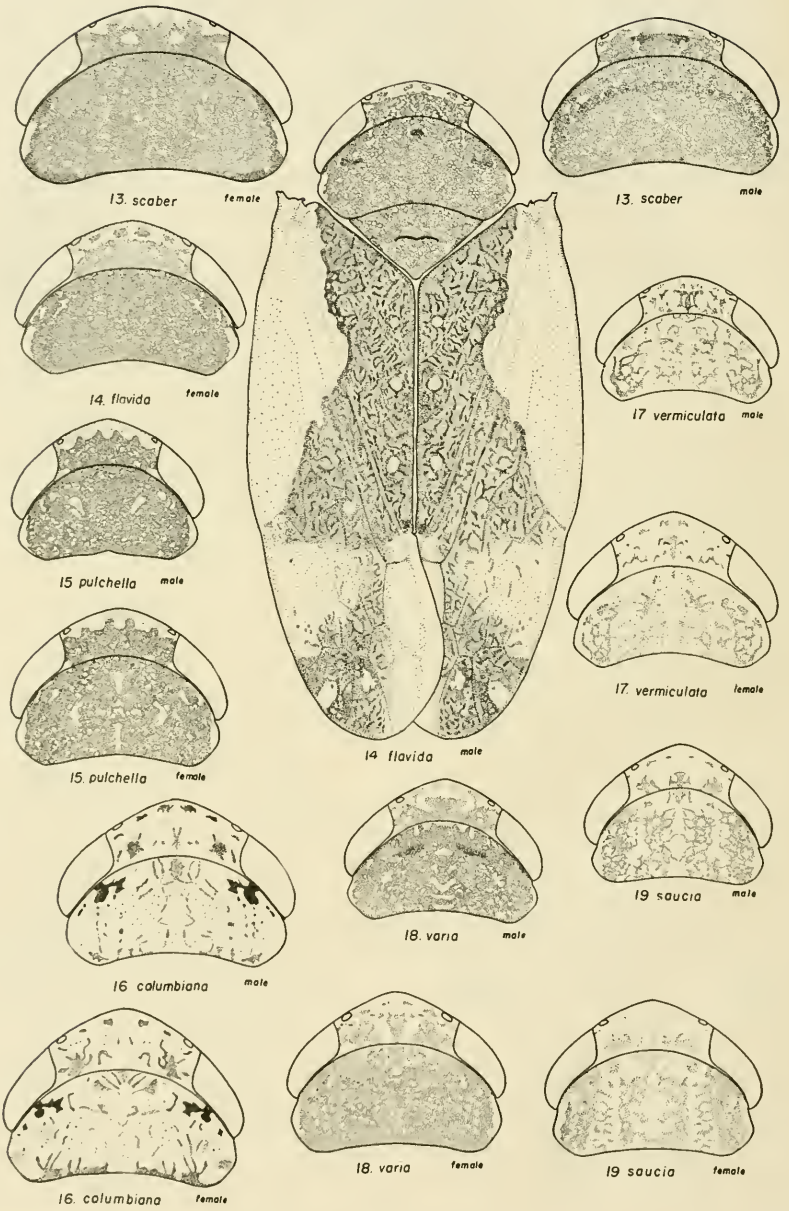

13. scaber female
13. scaber male
14. flavida female
17 vermiculata male
15 pulchella male
14 flavida male
17. vermiculata female
15. pulchella female
19 saucia male
18. varia male
16 columbiana male
18. varia female
19 saucia female
16. columbiana female

PLATE XXVI

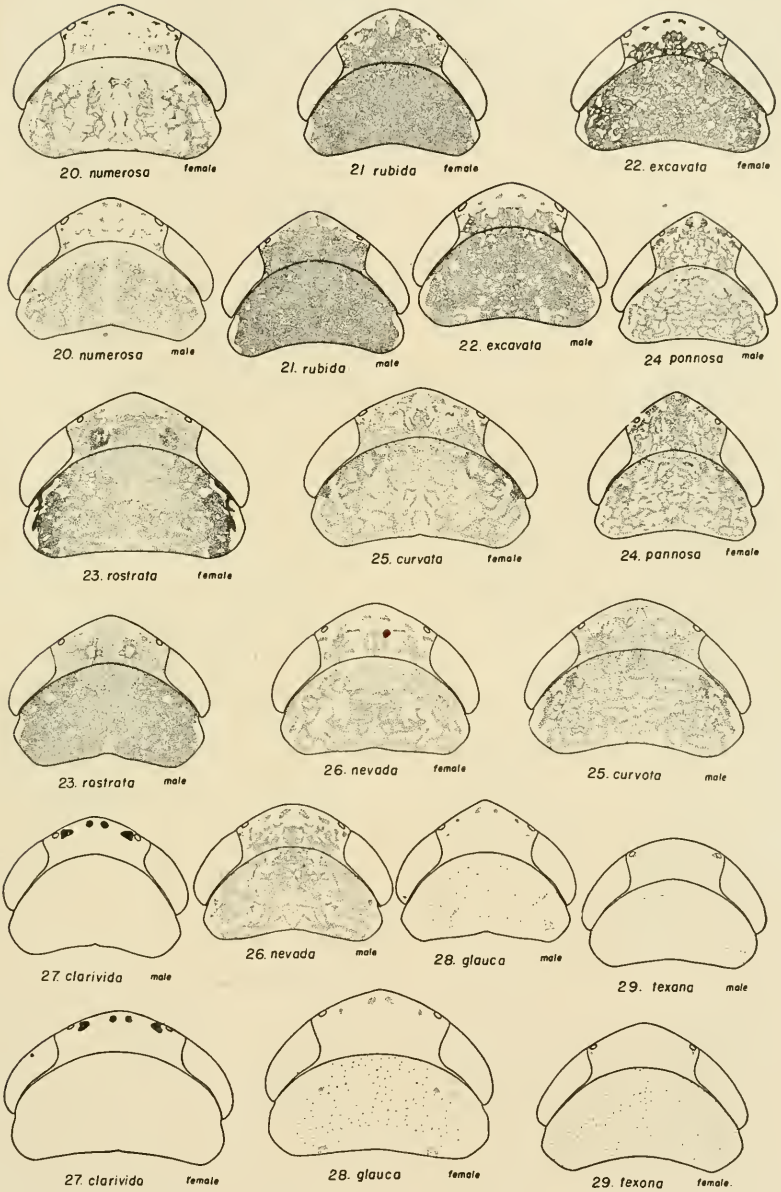

20. numerosa female
21 rubida female
22. excavata female
20. numerosa male
21. rubida male
22. excavata male
24 ponnosa male
23. rostrata female
25. curvata female
24. pannosa female
23. rostrata male
26. nevada female
25. curvata male
27. clarivida male
26. nevada male
28. glauca male
29. texana male
27. clarivida female
28. glauca female
29. texana female.

PLATE XXVII

1 apachana
2 bicolorata
2 bicolorata male
3 bicolorata var inflata
4 seminuda
4 seminuda
5. scitula
3. bicolorata var. inflata
6 pullata
7. chenopodii
7. chenopodii
5 scitula
8 helenae
8 helenae
9 snowi
9 snowi
10 perelegantis
10 perelegantis
11 mildredae
11 mildredae

PLATE XXVIII

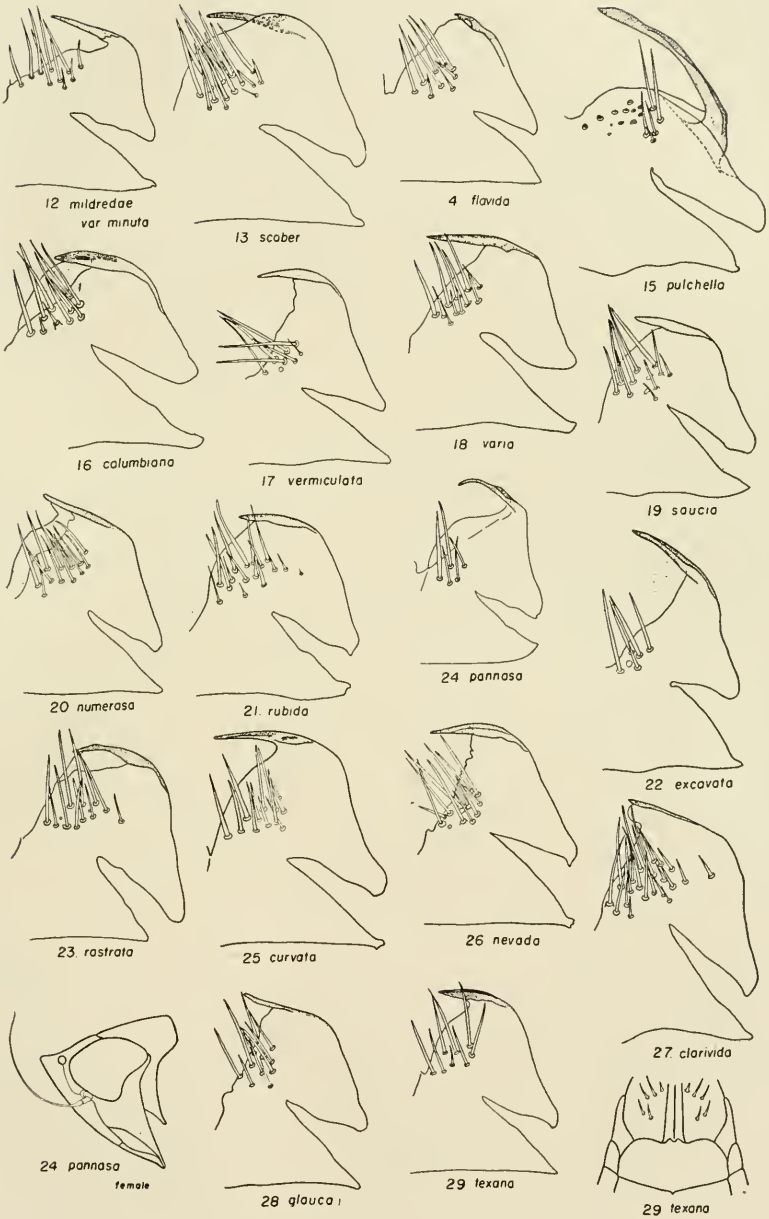


PLATE XXIX

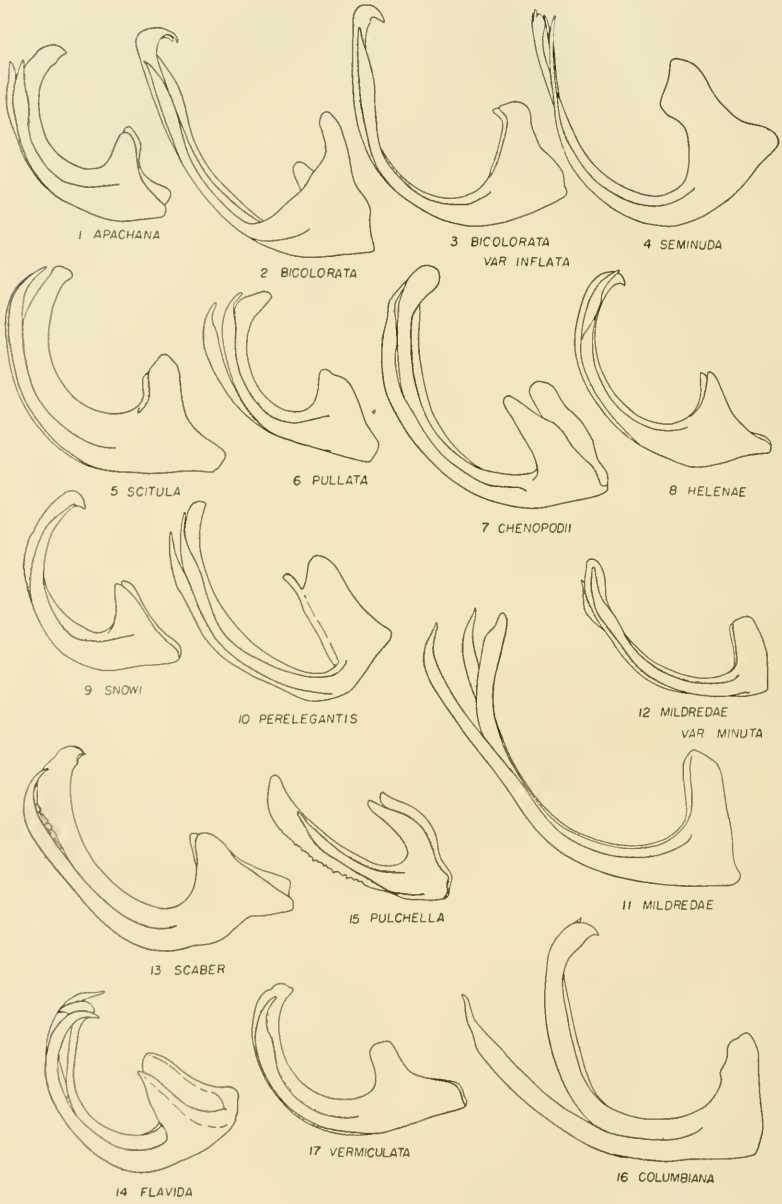
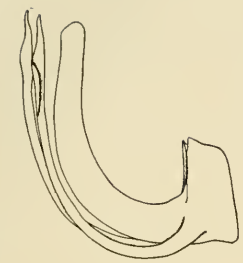
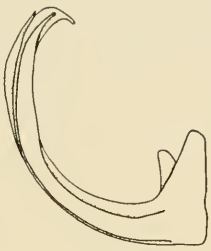

1 APACHANA
2 BICOLORATA
3 BICOLORATA VAR INFLATA
4 SEMINUDA
5 SCITULA
6 PULLATA
7 CHENOPODII
8 HELENAE
9 SNOWI
10 PERELEGANTIS
11 MILDREDAE
12 MILDREDAE VAR MINUTA
13 SCABER
14 FLAVIDA
15 PULCHELLA
16 COLUMBIANA
17 VERMICULATA

PLATE XXX

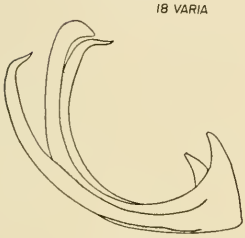


18 VARIA



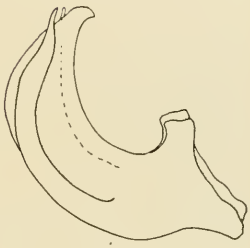
19 SAUCIA

20 NUMEROSA



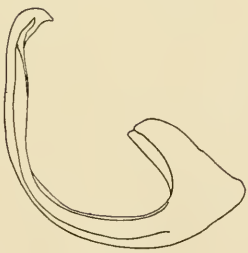
21 RUBIDA

22 EXCAVATA

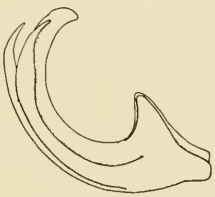


23 ROSTRATA

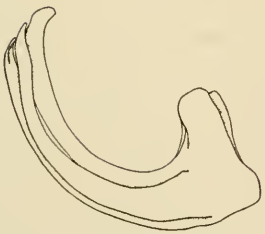
24 PANNOSA



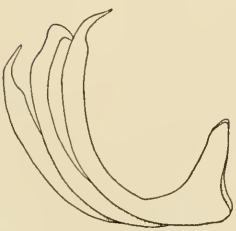
25 CURVATA



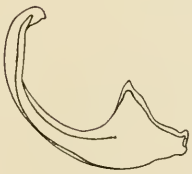
26 NEVADA



27 CLARIVIDA



28 GLAUCA



29 TEXANA

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A Revision of the Genus Listronotus: I (Curculionidae: Coleoptera)

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Department of Entomology, University of Kansas

ABSTRACT: This paper is a revision of the species of the Coleopterous family Curculionidae which are now considered to belong to the genus Listronotus. The species have been given a monographic treatment. All the information available pertaining to the biology and distribution of the species has been included.

Thirty-three species have been described in the genus. *L. distinguendus* (Gyllenhal) has already been listed as a synonym of *L. sordidus* (Gyllenhal). The following ten species have been reduced to synonymy in this paper: *L. obliquus* LeConte, *L. inaequalipennis* (Boheman), *L. sulcirostris* LeConte, *L. floridensis* Blatchley, *L. rudipennis* Blatchley, *L. latiusculus* LeConte (*nec* Boheman), *L. cribricollis* LeConte, *L. impressifrons* LeConte, *L. impressus* Van Dyke, and *L. leucozonatus* Chittenden. One species, *L. tessellatus* Casey, has been reduced to a subspecies of *L. oregonensis* (LeConte). The treatment of five species, *L. bagoiformis* Champion, *L. teretirostris* (LeConte), *L. gracilis* LeConte, *L. nevadicus* LeConte, and *L. punctiger* LeConte, has been deferred, since these species belong to the group of species now considered to comprise the genus Hyperodes, or are very closely associated with certain groups of Hyperodes and represent intermediate species. Seven species of Listronotus are herein described as new. They are: *L. ingens, L. manifestus, L. distinctus, L. insignis, L. blandus, L. blatchleyi,* and *L. similis.*

Type material of all the species except *L. sordidus* (Gyllenhal), *L. distinguendus* (Gyllenhal), *L. caudatus* (Say), and *L. squamiger* (Say) has been examined. The Say types are lost, and the Gyllenhal types are in Sweden and have not been examined.

No type species was designated for the genus when it was described. A genotype has been designated: *L. caudatus* (Say).

Illustrations and a key are included to assist in the determination of the species.

* Submitted to the Department of Entomology and the Faculty of the Graduate School of the University of Kansas in partial fulfillment of the requirement for the degree of Doctor of Philosophy.

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INTRODUCTION

SOME time ago, while looking over the Curculionidae with the intent of choosing a group of them for study, I noticed that very little had been done on the genus Listronotus since 1876, when LeConte's paper on the Rhynchophora was published. There was apparently a great deal of confusion in the genus, and it seemed to me that a revision of the group would be a worth-while endeavor. The present problem was begun, and I was soon confronted by keys that would not work and original descriptions that were often inadequate or even inaccurate. There was general confusion in the literature and in collections, due to frequent misdeterminations caused by the close relationship of some of the species and the amount of variation within a single species.

A large number of specimens have been studied during the preparation of this paper. Collections have been borrowed from various museums. Every species described in the genus has been studied. Some sort of type material, either type, cotype, or paratype, has been examined for every name proposed in the genus, except *L. sordidus* (Gyllenhal), *L. distinguendus* (Gyllenhal), and the species described by Say. An attempt has been made to study as much material as possible in order to secure all the available data on the distribution of the various species. All the available information on biology and host records has also been assembled.

By examining long series from varied localities, and by studying the variation exhibited by these specimens, a rather definite concept has been formed of what constitutes a species within this group. Most of the species of Listronotus display a great deal of variation, and therein lies the difficulty of a detailed study of the group. The statement may sound paradoxical, but I have seen two specimens belonging to different species which actually appeared to be more alike in many respects than two specimens representing extremes found within the same species. This is a rather drastic statement and demands an immediate explanation. As an example, we may find a male of *L. tuberosus* LeConte and a male of *L. sordidus* (Gyllenhal) which are so nearly alike that they defy separation by an inexperienced eye. After we have studied the two species for some time and have examined a large number of individuals in both of them, we begin to notice a rather characteristic appearance of each species, and then the two individuals can be readily separated. But the difference that one sees in these specimens may be very difficult to demonstrate to someone else and even more difficult to set down

in print or incorporate into a key—it is a difference of degree rather than one of kind. Where we have come to recognize certain external differences, our conclusion is borne out by finding a difference in the genitalia of the two specimens.

Now let us take the same specimen of *L. sordidus* (Gyllenhal) which was, let us say, from New Jersey, and compare it with a specimen of the same species from Louisiana. We may find a marked difference in size and color and, to a lesser degree, in certain external morphological characters. This type of variation is the one upon which LeConte described *L. obliquus*. The genitalia show very little difference, if any, except in size. Now let us examine a large number of individuals from Louisiana, from New Jersey, and from several other localities. We soon find a multitude of intermediate forms which tie the two extremes together, and if we were to continue to regard *L. obliquus* LeConte as a valid species we would have to find names for a large number of other variations. What we really have is one species exhibiting a wide range of variation.

This rather detailed discussion has been given purposely to illustrate some of the problems involved in this study and to assist in interpreting some of the conclusions set forth. Similar situations exist in other species, and several types of this same sort of problem have arisen during the course of this study.

There may be some who will consider that I have been too lax in drawing specific lines, but it should be remembered that we are endeavoring to build up a natural system of classification, and that species are artificial concepts which probably do not exist in nature in as precise a form as they do in the minds of some taxonomists. A species, especially one with a wide distribution, is confronted in nature with a great variety of environmental conditions, many of which exert a powerful influence on the growth and development of the individual. An attempt has been made to take this fact into consideration when making decisions and arriving at conclusions. The species have been treated in the manner which seemed most logical in the light of present information. Some of the problems will be solved definitely only by means of supplementary biological studies. With additional information from that source, and with more material available, some of the conclusions submitted in this paper may have to be altered. There is much to be learned about biological races and the effect of food plants and environment upon the species. When information is available concerning some of these factors it may be possible to explain some of the variation found

within certain species of Listronotus. It may even be possible to associate certain types of variation with certain ecological or environmental factors, or with certain biological races.

Since Listronotus has never been treated before in monographic form, the purpose of this paper is to bring together the literature and redescribe species which have very brief original descriptions. Inadequate descriptions have been supplemented, and inaccurate statements have been corrected. An attempt has been made to present as much biological information as is available. Illustrations and keys are given which should assist in the identification of the species. All material which could be secured has been examined in order to acquire as many data on distribution as possible. The lists of citations to the literature of the species do not purport to be entirely complete, but they do include all the more important references and a great many more which were found by a rather detailed search of the literature. There may be references in a few obscure places which have been overlooked. All the citations known to me concerning the economic literature of this group have been included. In a few cases where names have been published in error I have had access to the material in question and have been able to rectify the mistake. In other cases where names have been obviously cited in error, but the material has not been available for study, a note has been added calling attention to the error.

ACKNOWLEDGMENTS

As I am completing this paper I feel that I owe my greatest debt of gratitude to Dr. H. B. Hungerford, head of the Department of Entomology at the University of Kansas, under whose supervision the work has been done. I want to express my sincere appreciation for the excellent training in research technique received from him, for his sound advice on many occasions, for his willingness to help at any time, and above all for the constant source of inspiration which he has been to me. He has secured material from many museums for my use, and has made it possible for me to study other collections and types which could not be sent out on loan.

Dr. O. Lundblad has been most helpful in his willingness to send us types for examination from the museum at Stockholm, Sweden.

Through the kindness of Dr. W. Ludwig of the Zoologisches Institut at Halle, Germany, the type of *Listroderes latiusculus* Boheman has been examined.

To Dr. E. C. Van Dyke I wish to extend thanks for the privilege of studying type material of his species.

To Dr. J. J. Davis, of Purdue University, I wish to express my appreciation for the permission to study the Blatchley types and collection.

I am grateful to Mr. Nathan Banks and Dr. P. J. Darlington, Jr., for the privilege of studying in the Museum of Comparative Zoölogy at Harvard College. I am especially grateful to Doctor Darlington for his kindness and coöperation in making it convenient for me to study the LeConte and Dietz collections. I am also obliged to him for our trip to Tyngsboro, Mass., to visit Mr. H. C. Fall.

A very pleasant afternoon was spent in the home of Mr. Fall, who most cordially allowed me to examine his collection, which is an outstanding example of neatness and accuracy. I am indebted to him for the records obtained from his excellent series and for the permission to borrow specimens for the purpose of description.

Dr. Richard Dow, of the New England Museum of Natural History in Boston, was most amiable in assisting me in a study of the T. W. Harris collection and the material it contained which had been studied and determined by Thomas Say. He was also of assistance to me in checking on literature in the library of the Boston Society of Natural History.

A most pleasant and profitable day was spent in Philadelphia as the guest of Dr. James A. G. Rehn of the Philadelphia Academy of Natural Sciences, who took the time to show me through the library, exhibits, and various departments of the Academy. Dr. E. T. Cresson kindly assisted me in a study of the Horn collection.

To Doctors C. F. W. Muesebeck, E. A. Chapin, and L. L. Buchanan I wish to express my thanks for the privilege of visiting the United States National Museum and studying the Chittenden types, Casey collection and types, and other material located there. Doctor Buchanan was very helpful in making arrangements to facilitate my work in the museum, and our discussions pertaining to the taxonomy of the Curculionidae were most profitable to me.

To Dr. R. H. Beamer and Mr. Warwick Benedict of the staff of the museum at the University of Kansas, and to Dr. Milton W. Sanderson, a former associate in the Department of Entomology and friend of long standing, I wish to express my thanks for assistance and helpful suggestions.

Dr. Phil Leverault has been most helpful to me through his assistance in various morphological interpretations and by his suggestions relative to the application of morphological terms.

The correspondence I have had with Mr. Gale G. Bleasdell has been profitable and most enjoyable, and I sincerely appreciate his friendly coöperation.

To the following workers and institutions I want to express my gratitude for the loan of material: Clinton G. Abbott, San Diego Society of Natural History; Nathan Banks, Harvard College; Gale G. Bleasdell, Merriden, Iowa; W. J. Brown, Department of Agriculture, Entomological Branch, Ottawa, Canada; L. L. Buchanan, United States National Museum; E. A. Chapin, United States National Museum; E. T. Cresson, Philadelphia Academy of Natural Sciences; P. J. Darlington, Jr., Harvard College; J. J. Davis, Purdue University; Henry Dietrich, Ithaca, N. Y.; Richard Dow, New England Museum of Natural History; D. K. Duncan, Globe, Ariz.; H. C. Fall, Tyngsboro, Mass.; P. W. Fattig, Emory University, Georgia; C. A. Frost, Framingham, Mass.; Wm. J. Gerhard, Field Museum; C. C. Gregg, Field Museum; Maurice T. James, Colorado State College; J. N. Knull, Ohio State University; H. P. Löding, Mobile, Ala.; Frank Lutz, American Museum of Natural History; C. E. Mickel, University of Minnesota; Harlow B. Mills, Montana Experiment Station; C. F. W. Muesebeck, United States National Museum; A. L. Nelson, United States Bureau of Biological Survey; Miss Ada L. Olson, University of Michigan; H. J. Reinhard, College Station, Texas; H. H. Ross, Illinois Natural History Survey; C. W. Sabrosky, Michigan State College; E. C. Van Dyke, California Academy of Science; and J. R. Watson, Gainesville, Fla.

MORPHOLOGY AND TERMINOLOGY

A study was made of the location of the spiracles in order to determine what segments of the abdomen were actually represented by the visible sternal sclerites.

Two pairs of large spiracles are found in the thorax. The first of these pairs is in the membrane between the prothorax and the mesothorax. The second pair is in the membrane between the mesothorax and the metathorax and is situated directly behind the mesothoracic epimeron.

There are eight pairs of abdominal spiracles. The third pair of abdominal spiracles is associated with the first visible abdominal sternum, showing that it is in reality the third sternum. The two pairs of abdominal spiracles anterior to this region indicate that the first two sterna have either fused with the third or have dropped out. An examination of the anterior part of the abdomen reveals what is undoubtedly a remnant of the second sternum lying behind

and above the posterior coxae, and separated from the third sternum by a small inter-segmental fold. The first sternum has probably dropped out. The third and fourth sterna are rather firmly united, there being but little evidence of the antecosta, or inter-segmental infolding, found between the other sterna. There are five visible abdominal sterna, the last being the true seventh. There are often peculiar modifications of the seventh sternum, especially in the female. These may be in the form of elevated ridges, depressions, or pits.

The eighth sternum is internal. In the male there are two sclerotized sternites. In the female the greater portion of the sternum is sclerotized. The degree of sclerotization and the shape of the sclerotized areas is constant within a species, but differs in different species so that we have here a character of great taxonomic value.

Because of the characters of taxonomic value located on the abdominal sterna it is often necessary to refer to them individually. In the past there have been several terms applied to them which are undesirable for certain reasons. A common practice is to refer to them as "segments" of the abdomen. This term should not be used, because in its proper application it does not include the lower surface alone but the upper part, or tergum, as well. Perhaps the term in most common usage is "sternite." This term is a diminutive form of the word sternum and as such would be used by morphologists to designate one of two or more sclerotized divisions of the sternum, if it consisted of more than one sclerite. Since the sclerotized plates of the sterna represent essentially all of the sternal portion of the segment, they will be referred to as sterna.

The five visible abdominal sterna are generally referred to as the first to the fifth, inclusive. The next sternum, the one which is internal, is most often referred to as the eighth, its proper morphological number. This incongruity is confusing, and it would seem more desirable to follow some uniform system of referring to the number of the individual sterna, therefore they will be referred to their proper morphological positions, the five visible sterna being the third to the seventh, inclusive.

In the female the seventh tergum is the last one which is external. The eighth is internal, and its spiracles are very small and apparently closed and nonfunctional, although the tracheae still attach to them. In the male the eighth tergum is external and is sometimes referred to as the pygidium.

In discussing the antennae the terms in common usage have been utilized. The long basal segment is called the scape; the series of shorter segments, seven in this genus, is called the funicle; and the enlarged terminal part is called the club. The individual divisions of the antennae are sometimes referred to as "joints," but this term is not used because it generally implies the concept of an articulation rather than a segment. It would perhaps be more accurate to refer to some of the individual divisions of the antennae as subsegments, since we are told by the morphologists that the antenna is composed of three fundamental segments, and that any additional divisions are due to secondary segmentation, and are therefore subsegments. Since we do not know which of the divisions of the antennae of the Curculionidae are primary divisions and which are secondary divisions, the term segment will be used instead of subsegment.

The dorsal part of the prothorax is referred to in this paper as the disk of the prothorax rather than as the pronotum. The term pronotum usually refers to the dorsal sclerite of the prothorax. Since the entire prothorax of the Curculionidae is more or less fused into one somewhat tubular unit, there is no actual line of division between the pronotal region and the rest of the prothorax, and the pronotum does not exist as an actual unit. Therefore the term pronotum cannot be applied in its proper sense to the dorsal part of the prothorax of the Curculionidae. There is no other morphological term available to apply to this region of the body, and since it was not deemed advisable to coin a new term, the somewhat flattened dorsal portion of the segment is referred to simply as the disk of the prothorax.

In making measurements of the prothorax and other parts of the body an eyepiece micrometer has been used in a binocular. Relative proportions of the length and width of the prothorax are by actual measurement. These measurements do not always agree with what appears to be the condition from a casual observation of the specimen. The prothorax of a species may appear to be longer than wide, and indeed the original description may even describe it as such, but actual measurement may show the width to be equal to the length, or it may even be slightly wider than long. The prothoraces of the types of several species which were described as having the prothorax longer than wide have been measured and have been found to be wider than long. The measurement of the prothorax is made from a dorsal view. The longitudinal measurement

is made through a median line from the base to the apex and does not include the ocular lobes. The transverse measurement is made at the point of the greatest width.

The measurement of the length of the beak is made from a side view. It is the length of a line drawn from the lower corner of the apex to the top of the head at the point marked by the center of the frontal fovea. The mandibles are not included in this measurement since they are sometimes opened and, in these cases, extend for a considerable distance beyond the apex of the beak and would not give accurate or uniform measurements.

Another point which demands an explanation is that of the numbering of the intervals of the elytra. There are ten striae, dividing the elytra into eleven so-called intervals. In a very few cases some workers have referred to only a part of the elytron located between two striae as an interval. The strip between the first stria and the inner margin of the elytron is sometimes called the suture, and the strip between the first and second striae is sometimes called the first interval. In this paper the term suture indicates the actual line of division between the elytra along the median line of the body. The strip between the suture and the first stria is called the first interval, the strip between the first and second striae is called the second interval, and so on, accounting for eleven intervals.

In measuring the total length of the body the length of the beak is not included. The measurement is started at the front margin of the head if the beak is turned down, or if it protrudes anteriorly the measurement is begun from the anterior margin of the eyes. If there are caudal processes on the tips of the elytra they are included in the total length of the body.

Blatchley and Leng (1916, p. 155) state that the scattered black dots mentioned by LeConte on *Listronotus tuberosus* LeConte and on other species are only open punctures from which the scales have been lost. This is not the case. If the "black dots" are examined closely it will be seen that they are open punctures, but that they are larger than the other punctures, which can be uncovered by picking off the scales. It will also be seen that instead of the usual scales each of these larger punctures bears a stout semierect seta which is often black and for this reason is not plainly visible against the black exoskeleton of the insect and the shadow within the puncture.

GENITALIA

The male genitalia of Listronotus have been found to possess excellent taxonomic characters of specific value. The main differences lie in the shape of the median lobe and in the various hooks and

spines within the internal sac. The structures of the internal sac can be studied through the transparent membranes, without the sac being everted, if the preparation is examined in a liquid medium such as glycerine or alcohol. When the membranes become dry they are white and opaque, and the inner structure cannot be seen. There is a small amount of variation in the genitalia, but never enough to cause any confusion, even with closely related species.

The female genitalia are very similar throughout the genus. There are noticeable differences between some species, but in most cases they are of no value in separating species. The internal characters of the greatest value in the female are found in the eighth sternum, which has a characteristic shape in each species.

A number of different methods of preserving the genitalia have been tried, and the one found to be most satisfactory is to store the parts in a small amount of glycerine in the bottom of a tiny vial which is corked up and pinned through the cork to the same pin upon which the specimen is mounted.

Prior to the dissection of the genitalia the labels are removed from the pin, and the specimen is relaxed for a few minutes in a warm solution of five percent alcohol until sufficiently softened to be manipulated easily. In the case of the larger species a hooked *minute nadel* may be inserted through the posterior opening of the body, and by carefully severing the membranous connections between the sclerites of the eighth segment and those of the seventh, the genitalia and accessory parts may be removed. With smaller species it is sometimes more convenient to remove the entire abdomen, pull away the tergal portion, and then dissect out the desired parts. After the genitalia are removed from the body they should be put into a ten percent solution of caustic potash to soften and partially dissolve the muscle tissue which is attached. This process is hastened if the caustic is hot, and it may even be boiled. After the genitalia have been removed from the caustic the muscle and excess membranous tissue may be easily dissected away.

GEOGRAPHICAL DISTRIBUTION

The genus Listronotus as it is now defined occurs only in North America. Only one species is known from Mexico. Only a few of the species have a range which extends over the entire United States and southern portion of Canada. A number of the species have a more limited range which may include the southern states, or the central and eastern states. Some of the species are very local in their occurrence, having been recorded from only one or two states.

BIOLOGY

Very little is known of the biology of most of the species of Listronotus. The habits of many of the species are entirely unknown. Some have been taken on sandy or muddy ground along the margins of lakes and ponds. Others have been taken by sifting moss and debris in swamps, or they may be found under logs, pieces of wood, or under other cover, either in swamps or on dry ground. A specimen of *L. palustris* Blatchley in the T. W. Harris collection was found by Doubleday under the bark of rotten oak in eastern Florida. A number of the species are commonly taken at light.

Listronotus tuberosus LeConte has been reared from Sagittaria by Satterthwait. It was determined by him as *L. sordidus* (Gyllenhal), and the data are recorded under his Webster Groves No. 26558. Criddle has bred the species from Sagittaria at Treesbank, Manitoba.

Criddle has also bred *L. appendiculatus* (Boheman) from Sagittaria at Treesbank. It is quite often taken on Sagittaria and has also been taken on *Chelone glabra* and on Nelumbo.

Listronotus squamiger (Say) has been reared from *Scirpus validus* at Milford, Iowa, by Satterthwait.

Listronotus oregonensis (LeConte) does not seem to feed on semi-aquatic plants as do the other members of the genus whose host plant is known. There have been several published records of this species occurring on Sagittaria, but these records are probably based on *Hyperodes solutus* (Boheman). Chittenden (1924) first expressed doubt as to whether *L. oregonensis* (LeConte) was the species which had been reared from Sagittaria, and Buchanan (1932) indicates that the species reared from Sagittaria was *Hyperodes solutus* (Boheman). For a detailed discussion of the biological data known for *L. oregonensis* (LeConte), see the section on the biology of that species.

LISTRONOTUS AS FOOD OF CERTAIN ANIMALS

Through the coöperation of A. L. Nelson, Division of Wildlife Research, Bureau of Biological Survey, United States Department of Agriculture, I have been supplied with the data pertaining to numbers assigned to specimens found in the United States National Museum and Biological Survey material which had been recovered in stomach content studies. By the use of these data, some information can be given concerning the utilization of Listronotus as food by other animals.

One specimen has been found in the stomach of the water snake

Natrix sipedon. A number of individuals belonging to eleven different species of Listronotus have been taken from the stomachs of various species of Bufo. Judging from these data it would seem that Listronotus is an important item in the diet of toads. The following information is arranged according to the species of predator involved:

Bufo americanus.

L. tuberosus LeConte.

No. 2075. Douglas Lake, Cheboygan Co., Mich. June 26, 1915, W. A. Wood.

L. squamiger (Say).

No. 1946. Palo Alto Co., Iowa, 7-16-07, A. G. Ruthven. One male.

No. 1962. Palo Alto Co., Iowa, 7-5-07, A. G. Ruthven. One female.

No. 1984. Harbert, Berrien Co., Mich., July 13, 1917, A. G. Ruthven. Two females.

No. 2412. Stevens Pt., Mellen, Wis., July 19, 1918, A. I. Ortenburger. One female.

L. caudatus (Say).

No. 2052. Lost Island Lake, Clay Co., Iowa, July 26, 1918, A. G. Ruthven. One male.

No. 2353. Holcomb, Wis., July 28, 1918, A. I. Ortenburger. Two males.

L. frontalis LeConte.

No. 1997. Lakeside Lab., Milford, Iowa, F. M. Blanchard.

No. 2052. Lost Island Lake, Clay Co., Iowa, July 26, 1918, A. G. Ruthven. One male.

L. oregonensis (LeConte).

No. 1984. Harbert, Berrien Co., Mich., July 13, 1917, A. G. Ruthven. One male.

No. 1997. Lakeside Lab., Milford, Iowa, F. M. Blanchard. One female.

No. 2052. Lost Island Lake, Clay Co., Iowa, July 26, 1918, A. G. Ruthven. Three females.

L. appendiculatus (Boheman).

No. 2002. Lakeside Lab., Milford, Iowa, July 3, 1920, F. N. Blanchard. One female.

No. 2052. Lost Island Lake, Clay Co., Iowa, July 26, 1918, A. G. Ruthven. One female.

Bufo hemiophrys.

L. tuberosus LeConte.

No. 1810. Larimore, Grand Forks Co., North Dakota (Turtle River), June 22-30, 1915, R. Kellogg.

Bufo terrestris.

L. frontalis LeConte.

No. 1428. Lake Kissimmee, Fla., E. A. Mearns. One female.

L. palustris Blatchley.

No. 1387. Lake Kissimmee, Fla., E. A. Mearns. One male.

No. 1390. Lake Kissimmee, Fla., E. A. Mearns. One male.

No. 1438. Lake Kissimee, Fla., E. A. Mearns. Abdomen and elytra of one female.

L. blandus Henderson
No. 1303. Lake Kissimmee, Fla., E. A. Mearns. One male.
No. 1376. Lake Kissimmee, Fla., E. A. Mearns. One female.
No. 1377. Lake Kissimmee, Fla., E. A. Mearns. One male; one female.
No. 1387. Lake Kissimmee, Fla., E. A. Mearns. One male; one female.
No. 1388. Lake Kissimmee, Fla., E. A. Mearns. One male.
No. 1389. Lake Kissimmee, Fla., E. A. Mearns. One male.
No. 1392. Lake Kissimmee, Fla., E. A. Mearns. One female.
No. 1417. Lake Kissimmee, Fla., E. A. Mearns. One female.
No. 1439. Lake Kissimmee, Fla., E. A. Mearns. Two females.
No. 1443. Lake Kissimmee, Fla., E. A. Mearns, 1891. One male.
L. oregonensis (LeConte).
No. 1387. Lake Kissimmee, Fla., E. A. Mearns. One male.
No. 1434. Lake Kissimmee, Fla., E. A. Mearns. One male; one female.
No. 2301. Oklanaha River, Fla., Jan. 4, 1914, H. S. Cole. One female.
L. insignis Henderson.
No. 1260. Lake Kissimmee, Fla., E. A. Mearns. One male.
No. 1300. Lake Kissimmee, Fla., E. A. Mearns. One female.
No. 1303. Lake Kissimmee, Fla., E. A. Mearns. One male; one female.
No. 1326. Kissimmee River (?), Fla., E. A. Mearns. One male.
No. 1377. Lake Kissimmee, Fla., E. A. Mearns. One female.
No. 1389. Lake Kissimmee, Fla., E. A. Mearns. Two females.
No. 1432. Lake Kissimmee, Fla., E. A. Mearns. One male.
No. 1439. Lake Kissimmee, Fla., E. A. Mearns. One female.
L. appendiculatus (Boheman).
No. 1384. Lake Kissimmee, Fla., E. A. Mearns. One female.
No. 1392. Lake Kissimmee, Fla., E. A. Mearns. One female.
Bufo valliceps.
L. sordidus (Gyllenhal).
No. 1504. New Orleans, La., May 15 (?), So. Biol. Supply.
L. blandus Henderson.
No. 1465. Belair, La., June 10, 1910, Andrew Allison. One male.
Bufo woodhousii.
L. nebulosus LeConte.
No. 2080. Waco, Texas, May 2, 1911, J. K. Strecker. One female.
Natrix sipedon.
L. squamiger (Say).
No. 109. Bennings Marsh, D. C., April 22, 1917, E. G. Holt.

HISTORICAL SKETCH

The first species of Listronotus was described by Thomas Say in 1824 as *Rhynchaenus caudatus.* In 1826 Schönherr described the genus Listroderes with the South American *Listroderes costirostris* Gyllenhal as the type species. In 1831 Say referred his species *caudatus* to the genus Listroderes and described *Listroderes squamiger* Say. In 1834 Gyllenhal described *Listroderes distinguendus* and *Listroderes sordidus.* In 1842 Boheman described *Listroderes inaequalipennis* and *Listroderes appendiculatus.* In 1860 LeConte described *Listroderes teretirostris* and *Listroderes oregonensis.*

In 1864 Jekel wrote his "Recherches sur la Classification Naturelle des Curculionides," in which he described the genus Listronotus. He does not definitely designate a type species, but mentions the names *caudatus, squamiger,* and *inaequalipennis* at the beginning of the paragraph of discussion in which Listronotus is named.

In 1876 LeConte brought together the North American species which had been placed in the genus Listroderes and treated them as Listronotus, describing fourteen new species, *obliquus, tuberosus, callosus, americanus, rotundicollis, sulcirostris, nebulosus, frontalis, cribricollis, impressifrons, setosus, punctiger, gracilis,* and *nevadicus.* He included the genus Listronotus, along with Macrops, in a division which he called Listroderi, under the tribe Phytonomini in the subfamily Curculioninae.

LeConte and Horn in their "Classification of the Coleoptera of North America," published in 1883, again include Listronotus and Macrops in the Listroderi group of the tribe Phytonomini within the subfamily Curculioninae.

Casey described two species of Listronotus in 1895, *L. scapularis* and *L. tessellatus.*

In 1902 Champion placed Listronotus and Hyperodes in his Listroderina Group. In regard to the relationship of Listronotus to the rest of the Curculionidae he states: "The affinites of this group, as shown by the Australian genus Desiantha, Pasc., seem to me to be with the Erirrhina (Hydronomides), and not with the Hyperina, amongst which it is placed by all North American writers." In regard to the species included within Listronotus, he says: "The North American species referred to Listroderes by Gyllenhal were separated by Jekel from that genus under the name Listronotus, and this course has been followed by LeConte, the chief difference being the posteriorly evanescent scrobes in the South American forms." At this time Champion described *Listronotus bagoiformis.*

Blatchley and Leng include Listronotus in the tribe Hyperini of the subfamily Curculioninae, in their arrangement of the genera in "The Rhynchophora of Northeastern America," which appeared in 1916. Blatchley described four species of Listronotus in this work, *palustris, rudipennis, floridensis,* and *debilis.*

In the "Catalogue of the Coleoptera of America, North of Mexico" Leng, in 1920, places Listronotus in a group Listroderi of the tribe Hyperini, following LeConte in this regard.

Chittenden in 1926 described a species of Listronotus which he called *leucozonatus.* Van Dyke described *L. impressus* and *L. elegans* in 1929.

In 1931 Pars 114 of the Junk "Coleopterorum Catalogus" appeared, covering part of the Curculionidae. Schenkling and Marshall, the authors of this section, include Listronotus along with Hyperodes, Listroderes, and related genera, in the subfamily Cylindrorrhininae.

ORIGINAL DESCRIPTION OF LISTRONOTUS JEKEL

"Les unes, la plupart de grande taille (*Caudatus, Squamigêr, Inaequalipennis*) ont, ainsi que l' observe M. Lacordaire (loc. cit., p. 344 note 2), quelques rapports avec les *Plinthus* pr. d. (Lacord.), et me paraissent pouvoir en être rapprochées, ainsi que le genre *Eudocimus*, auquel elles ressemblent davantage qu'à tout autre groupe, et qui ne devra pas rester près des *Heilipus*. Elles se distinguent de quelques autres espèces de l' Amérique du nord, relativement très petites (ex.: *Humilis* Sch.), par leurs élytres plus planes en dessus, conjointement émarginées à leur base, à côté de cette base, remontant assez anguleusement en dehors et au delà des côtés de la base du thorax, avec les épaules assez obliquement et brusquement abaissées, puis les côtés parallèles jusque près des trois quarts de la longueur; elles sont ensuite étranglées dans leur partie postérieure rétrécie, et leur sommet est prolongé aiguëment, formant parfois une sorte de queue quelque peu recourbée inférieurement chez certains ♂. L' antenne a son scape atteignant seulement l'oeil, sans empiéter sur lui, et le deuxième article du funicule est beaucoup plus long que le premeir. Le rostre, long, contigu à la tête qui est très courte et enfoncée presque jusqu'aux yeux, affecte conjointement avec elle une forme subconique, est pour ainsi dire aussi large qu'elle à sa base, et se rétrécit insensiblement jusque vers l'extrémité qui est un peu elargie; de plus, les yeaux étant latéraux, le front se trouve avoir une bien plus grande largeur que chez les vrais *Listroderes*, et sert de base au cône supposé que forment la tête et le rostre pris ensemble. Le thorax est à peine élargi antérieurement, convexiuscule, et ne justifie déjà plus le nom imposé au genre. Je nomme cette coupe *Listronotus*, car il n'y a en effet que le dos de l'élytre qui soit aplani."

GENOTYPE

No type species was designated by Jekel in his original description of the genus Listronotus, although at the beginning of the paragraph he mentions the names *caudatus, squamiger,* and *inaequalipennis.* Since *caudatus* was the first of the three names mentioned by Jekel in the original description of Listronotus and was also the

first species described which is now assigned to this genus, I hereby designate *Listronotus caudatus* (Say) as the type species of the genus Listronotus.

STATUS OF THE GENUS

The genus Listronotus is very superficially separated from Hyperodes by characters which are not of generic value. If the generic distinctions were strictly adhered to, certain species of one genus would have to be transferred to the other genus, and then there would be found some intermediate species which could not be definitely placed because of the possession of some of the characteristics of both genera.

This paper has been limited to the species now considered to belong to the genus Listronotus. The species described by LeConte as *Listronotus nevadicus* has not been included, because it has been found to belong to Dietz's Ulkei Group, or Blatchley and Leng's Group II, of the genus Hyperodes. The species represented by the names *L. teretirostris* (LeConte), *L. punctiger* LeConte, *L. gracilis* LeConte, and *L. bagoiformis* Champion are among the intermediate species mentioned above, and their treatment is being deferred until the appearance of a subsequent paper. Work is in progress on a treatment of the species now listed as Hyperodes. After these species have been studied in detail and the intermediate forms have been carefully considered, the entire series of species will be rearranged, generic concepts will be clarified, and generic limits will be defined. Due to the early stages of the work on this next group of species it would be premature at the present time to attempt to define the genus Listronotus.

According to present concepts the following characters may be utilized to recognize a member of the genus Listronotus: abdominal sterna very unequal, the fifth and sixth together not, or scarcely longer than the fourth or seventh; mandibles two-toothed at tip; antennae with second segment of funicle about twice as long as first; tibiae bent at tip and strongly mucronate at apex.

POSITION OF THE GENUS

Listronotus has been included by American authors in the tribe Hyperini of the subfamily Curculioninae. Champion (1902, p. 120) was of the opinion that it should be associated with the Erirrhinae. The latest work in regard to the placing of the genus was done in 1931 by Schenkling and Marshall in the Junk "Coleopterorum Catalogus." They consider it to be allied to Listroderes and other

closely related genera, mostly South American and Australian, all of which are included in the subfamily Cylindrorrhininae.

KEY TO THE SPECIES OF LISTRONOTUS

1. Head clothed with slender scales or setae in the region above the interocular space, 2
   Head clothed with rounded scales in the region above the interocular space..... 23
2. Antennae with third segment of funicle longer than fourth..... 3
   Antennae with third segment of funicle not longer than fourth, third to seventh segments rounded, subequal..... 19
3. Antennae with third segment of funicle slender, elongate, distinctly longer than fourth 4
   Antennae with third segment of funicle only slightly longer than fourth..... 14
4. Antennae with fourth segment of funicle elongate, longer than fifth..... 5
   Antennae with fourth segment of funicle rounded, not longer than fifth..... 8
5. All elytral intervals equally convex; base of elytra not elevated..... 6
   Alternate elytral intervals more strongly convex; extreme base of elytra slightly elevated along the first five intervals 7
6. Scales on median half of disk of prothorax broad and rounded; beak about as long as prothorax, lateral carinae usually feeble; apical mucro of tibiae with small basal tooth; elytra usually with numerous transverse wrinkles, the intervals slightly convex; females with an elongate cylindrical process at the tip of each elytron. *caudatus*, p. 234
   Scales on median half of disk of prothorax slender, setiform; beak longer than prothorax, distinctly tricarinate; apical mucro of tibiae without basal tooth; elytra without transverse wrinkles, the intervals nearly flat; females without caudal processes on elytra ..... *ingens*, p. 243
7. Beak clothed with setae, tricarinate; elytral declivity laterally compressed and nearly vertical; subapical calli not prominent, elytra with numerous transverse wrinkles; apical mucro of tibiae without basal tooth; length, 10.5-14 mm., *americanus*, p. 245
   Beak clothed mostly with broad, rounded scales, the lateral carinae not prominent; elytral declivity not laterally compressed and vertical, subapical calli rather prominent, elytra without transverse wrinkles; apical mucro of tibiae with a small basal tooth; length, 8-11 mm..... *callosus*, p. 247
8. Posterior callus of elytra prominent 9
   Posterior callus of elytra not prominent 11
9. Beak clothed with setae; humeri rounded; posterior tibiae not denticulate along inner margin; female with two strongly elevated folds toward the tip of the last visible abdominal sternum ..... *squamiger*, p. 250
   Beak clothed with rounded scales; humeri rectangular; posterior tibiae denticulate along inner margin 10
10. Posterior callus of elytra very prominent, conical; beak about as long as prothorax, median carina very fine or absent, lateral sulci obsolete; frontal fovea moderately deep; elytra with transverse wrinkles, all intervals equally convex; scales of prothorax distinctly larger than those of elytra; apical mucro of tibiae rather long; female elytra with long slender caudal processes which are often convergent at the tip..... *tuberosus*, p. 259
    Posterior callus of elytra not conical; beak longer than prothorax, the median carina prominent, lateral sulci rather deep; frontal fovea deep; elytra without transverse wrinkles, the alternate intervals more strongly convex; scales of prothorax not distinctly larger than those of elytra; apical mucro of tibiae short; female elytra with short, stout, parallel caudal processes..... *sordidus*, p. 263
11. Beak clothed with broad scales, the median carina distinct, the lateral carinae faint or absent 12
    Beak clothed with setae, distinctly tricarinate..... 13
12. Ocular lobes very large and prominent, produced anteroventrally; setae of elytra not conspicuous; prothorax finely punctate, sides nearly parallel, the scales no larger than those of elytra; beak longer than prothorax; base of elytra feebly emarginate; apical mucro of tibiae without basal tooth; female with seventh (fifth visible) abdominal sternum unmodified, seventh tergum deeply emarginate at apex. *manifestus*, p. 269

Ocular lobes normal; setae of elytra long and clavate; prothorax coarsely punctate, the sides strongly rounded, the scales distinctly larger than those of the elytra; beak as long as the prothorax; elytra strongly emarginate at base; apical mucro of tibiae with basal tooth; seventh (fifth visible) sternum of female with a large deep median impression, seventh tergum truncate at apex..... *rotundicollis*, p. 271

13. Elytra without angulate prominence behind the humeri, intervals convex, setae not confused on odd intervals; beak as long as prothorax, frontal fovea surrounded by setae; prothorax coarsely punctate; apical mucro of tibiae with basal tooth; posterior tibiae not denticulate along inner margin..... *distinctus*, p. 274

Elytra with angulate post-humeral prominence, intervals nearly flat, setae confused on odd intervals; beak longer than prothorax; frontal fovea surrounded by broad scales; prothorax finely punctate; apical mucro of tibiae without basal tooth; posterior tibiae denticulate along inner margin..... *scapularis*, p. 276

14. Alternate intervals of elytra more strongly convex, humeri rectangular, base deeply emarginate and slightly elevated, setae confused on odd intervals, striae coarsely punctate; apical mucro of tibiae without basal tooth; scales of prothorax distictly larger than those of elytra; frontal fovea surrounded by setae..... 15

All intervals of elytra equally convex, humeri rounded, base feebly emarginate and not elevated, setae in a single row on all intervals, striae finely punctate; apical mucro of tibiae with a small basal tooth; scales of prothorax not distinctly larger than those of elytra; frontal fovea surrounded by broad scales..... 16

15. Elytra with transverse wrinkles; beak as long as prothorax; posterior tibiae denticulate along inner margin; length, 9-12.5 mm..... *blatchleyi*, p. 279

Elytra without transverse wrinkles; beak longer than prothorax; posterior tibiae not denticulate along inner margin; length, 6.5-9 mm..... *palustris*, p. 281

16. Beak clothed with broad scales and some setae; prothorax not granulate-punctate, the sides broadly rounded; apical mucro of tibiae long..... 17

Beak clothed with setae; prothorax granulate-punctate, the sides strongly rounded; apical mucro of tibiae short..... 18

17. Beak tricarinate, longer than prothorax; prothorax coarsely punctate, without median subapical impression; ventral surface coarsely punctate; posterior tibiae denticulate along inner margin..... *blandus*, p. 282

Beak with lateral carinae obsolete, equal in length to the prothorax; prothorax finely punctate, with a median subapical impression usually present, at least in the female; ventral surface finely punctate; posterior tibiae not denticulate along inner margin..... *frontalis*, p. 284

18. Body piceous, scales mostly brown or cupreous; beak usually slightly longer than prothorax; frontal fovea usually only moderately deep, surrounded by brownish or cupreous scales..... *oregonensis*, p. 288

Body black, scales black and cinereous; beak as long as prothorax; frontal fovea deep, covered with a small spot of cinereous scales which are surrounded by a circle of black scales..... *oregonensis* subsp. *tessellatus*, p. 297

19. Beak rounded, not carinate or sulcate, about as long as prothorax..... *elegans*, p. 300

Beak carinate and sulcate, either shorter or longer than prothorax..... 20

20. Beak shorter than prothorax, lateral carinae usually faint; base of elytra deeply emarginate, humeri rectangular; scales of prothorax not distinctly larger than those of elytra; elytra without any characteristic markings on posterior portion, 21

Beak longer than prothorax, tricarinate; base of elytra feebly emarginate, humeri rounded; scales of prothorax distinctly larger than those of elytra; elytra often with characteristic markings on posterior portion..... 22

21. Apical mucro of tibiae without basal tooth; width of beak at point of insertion of antennae usually less than nine-tenths the width of the interocular space directly across the frontal fovea; prothorax nearly quadrate, the sides broadly rounded. *nebulosus*, p. 301

Apical mucro of tibiae usually with a small acute basal tooth; width of beak at point of insertion of antennae usually nine-tenths or more of the width of the interocular space directly across the frontal fovea (in some cases, especially in the males, these measurements may be equal); prothorax slightly wider than long, sides strongly rounded..... *similis*, p. 304

22. Prothorax moderately punctate, head and ventral surface finely punctate; beak clothed with coarse setae, median carina sometimes less prominent than lateral

carinae, especially in basal region; posterior half of elytra usually covered with lighter scales; body dark reddish-brown; posterior tibiae not denticulate along inner margin, almost straight at apex, apical mucro short..... *appendiculatus*, p. 306

Prothorax coarsely and deeply punctate, head and ventral surface coarsely punctate; beak clothed with fine setae, median carina distinct; elytra usually with a narrow region of lighter scales at the beginning of the declivity with the posterior part covered by dark shining scales; body piceous; posterior tibiae denticulate along inner margin, rather strong curved at apex, the apical mucrones long. *insignis*, p. 313

23. Beak distinctly tricarinate; elytral intervals convex, the alternate ones more strongly so; elytral striae coarsely punctate..... *setosus*, p. 315

Beak with lateral carinae indistinct or obsolete, median carina fine; elytral intervals flat; elytral striae finely punctured..... *debilis*, p. 317

Listronotus caudatus (Say) 1824

(Plate XXXII, fig. 2; plate XXXVII, fig. 11)

1824. *Rhynchaenus caudatus* Say, Jr. Acad. Nat. Sci. Phil., Vol. III, p. 311.

1831. *Listroderes caudatus* (Say). Say, Desc. n. sp. Am. Curc., p. 11.

1834. *Listroderes caudatus* (Say). Gyllenhal, *in* Schönherr, Gen. et Spec. Curc., II, 1, p. 278.

1842. *Listroderes caudatus* (Say). Boheman, *in* Schönherr, Gen. et Spec. Curc., VI, 2, p. 189.

1853. *Listroderes caudatus* (Say). Melsheimer, Catalogue of the described Coleoptera of the United States, p. 95.

1859. *Rhynchaenus caudatus* Say, Complete Writings of Thomas Say, ed. LeConte, Vol. I, p. 27.

1859. *Listroderes caudatus* (Say). Say, Complete Writings of Thomas Say, ed. LeConte, Vol. II, p. 174.

1871. *Listroderes caudatus* (Say). Gemminger and Harold, Catalogus Coleopterorum, VIII, p. 2360.

1873. *Listroderes caudatus* (Say). Crotch, Check List of the Coleoptera of America, North of Mexico, p. 118.

1876. *Listronotus caudatus* (Say). LeConte, Proc. Am. Phil. Soc., Vol. XV, p. 131.

1878. *Listronotus caudatus* (Say). Popenoe, Trans. Kan. Acad. Sci., Vol. VI, p. 85.

1890. *Listronotus caudatus* (Say). Beutenmüller, Can. Ent., Vol. XXII, p. 200.

1893. *Listronotus caudatus* (Say). Beutenmüller, Jr. N. Y. Ent. Soc., Vol. I, p. 40.

1895. *Listronotus caudatus* (Say). Hamilton, Trans. Am. Ent. Soc., XXII, p. 344.

1903. *Listronotus caudatus* (Say). Ulke, Proc. U. S. N. M., XXV, p. 33.

1910. *Listronotus caudatus* (Say). Smith, Insects of New Jersey, p. 382.

1916. *Listronotus caudatus* (Say). Blatchley and Leng, Rhynchophora of North Eastern America, p. 156.

1920. *Listronotus caudatus* (Say). Leng, Catalogue of the Coleoptera of America, North of Mexico, p. 316.

1922. *Listronotus caudatus* (Say). Hayes, Trans. Kan. Ac. Sci., XXX, 2, p. 207.

1928. *Listronotus caudatus* (Say). Leng, Cornell Univ. Agri. Exp. Sta., Memoir 101, p. 495.

1931. *Listronotus caudatus* (Say). Schenkling and Marshall, *in* Junk, Coleopterorum Catalogus, Subfam. Cylindrorrhininae, Pars 114, p. 11.

1937. *Listronotus caudatus* (Say). Bleasdell, Iowa St. Coll. Jr. Sci., Vol. XI, No. 4, p. 416.

ORIGINAL DESCRIPTION. "Imbricate, dusky-cinereous, tinged with golden; elytra caudate.

"Inhabits Missouri.

"Body dusky-cinereous, covered with minute scales, and obsoletely tinged with golden, a paler lateral vitta: head obscurely golden: eyes deep black: rostrum with a slightly elevated line: beneath deep black: antennae blackish-brown; thorax obscurely

golden, with minute, elevated, black dots: scutel golden: elytra with regular series of punctures; golden color more obscure than that of the thorax; tip of each, elongated into an obtuse caudiform projection: beneath obscurely golden, varied with black: feet fuscous, with short hair; thighs dilated before the tip; a cinereous fascia on the two posterior pairs.

"Length, from the anterior part of the head to the tip of the elytral processes, rather more than two-fifths of an inch.

"Found near Engineer Cantonment on the Missouri river. The caudal processes are peculiar to one sex."

ADDITIONAL DESCRIPTION. *Length,* 8 to 12.5 mm. Elongate-oblong, rather robust. Body black, thickly covered with dark-brown scales. In some individuals the scales may be light brown or even yellowish-brown, while in other cases they may have a distinctly cupreous tinge. Head, anterior margin of prothorax, a small median basal spot on the prothorax, base of elytra, and scutellum covered with slender, elongate scales which are usually bright, shining cupreous, but are sometimes shining golden, or may be dull brown. There is a rather narrow vitta of paler scales at each side of the disk of the prothorax and sometimes a very narrow pale median vitta in which the scales may be slightly narrower. *Beak* scarcely as long as prothorax; median carina narrow, smooth, polished, slightly elevated; lateral carinae and lateral sulci usually obsolete; punctures of beak moderately coarse, dense, sometimes slightly rugose, mostly covered by cupreous scales which are somewhat broader than those of head; a few scattered broader scales, especially on the basal portion of the beak. *Antennae* dark reddish-brown; second segment of funicle about twice as long as first; third segment noticeably longer than the fourth. *Head* very convex, densely punctate; frontal fovea rather deep, elongate. Disk of *prothorax* one-fifth wider than long; ocular lobes moderately developed; sides of prothorax of male nearly straight from base to apical third and then curving in, female with sides more evenly rounded along entire length, with greatest width about at middle; disk slightly convex, densely punctate, the punctures being covered by scales; a few scattered larger punctures on disk open and bearing setae. *Scutellum* slightly elongate. *Elytra* deeply emarginate at base, humeri right-angulate; striae fine, with very small, remote punctures, each bearing a tiny seta; intervals very slightly convex, with a tendency for the third and fifth to be more convex; each interval with a row of short, suberect, sparsely placed setae, the third,

fifth, and sometimes the seventh intervals with two or three confused rows of setae; the elytra with scattered transverse wrinkles which may traverse one or two, or occasionally parts of three intervals. *Ventral surface* with sides of the third and fourth abdominal sterna thickly clothed with broad, cupreous or dark-brown scales, with a few intermixed black ones; elsewhere with less densely placed elongate scales. *Male* with elytra conjointly rounded at tip. *Female* with elytra separately prolonged at tip into rather long, cylindrical processes which are usually parallel but may be convergent and are sometimes tapering instead of cylindrical. The seventh (fifth visible) abdominal sternum of the female is slightly wider than long, with a shallow, elongate concavity toward each lateral margin and an indistinct triangular concavity on the median caudal portion, with the apex of the triangle cephalad. The triangular concavity is sparsely and finely punctate, with the punctures bearing slender semierect setae. The lateral concavities are densely punctate, with the setae prostrate and somewhat thicker. There are a few scattered punctures which are larger and bear rather long, erect, stiff hairs. The median anterior portion of the seventh (fifth visible) sternum is impunctate, shining and alutaceous; the tip is slightly rounded, with a faint emargination toward each side. The conditions described above are typical, but there are slight variations found in some specimens. The modification, however, is never very great.

Notes on Types. The types of this species have been lost or destroyed and neotypes are being erected. A map of the itinerary and camp sites of the expedition of which Say was a member at the time he took this species has been checked, and "Engineer Cantonment" on the Missouri river, the type locality given in the original description, was found to be very near the present location of Council Bluffs, Iowa. Neotypes have been chosen, therefore, from Kansas, Missouri, and Iowa, all in the general region from which the species was described. Neoholotype and neoallotype deposited in the Francis Huntington Snow Entomological Collections at the University of Kansas. Neoparatypes in the Snow Collections and in the United States National Museum.

Neoholotype male, "Douglas Co., Ks., 6-22-34, L. S. Henderson." Neoallotype female, "Douglas Co., Ks., 6-22-33, L. S. Henderson." Seventeen neoparatypes as follows: 1 male, "Douglas Co., Ks., 6-22-33, L. S. Henderson"; 1 female, "Lawrence, Kansas, 6-26-33, L. S. Henderson, At Light"; 1 female, "Lawrence, Kas., 7-13-35, L.

S. Henderson, Collected at Light"; 1 female, "Lawrence, Kas., 6-17-36, L. S. Henderson, Collected at Light"; 1 male, "Leavenworth Co., Kans., 6-22-33, L. S. Henderson, Collected At Light"; 1 female, "Topeka, Ks., Popenoe"; 1 female, "Topeka, Kan., Jul. 19, Popenoe"; 1 male, "Mo."; 1 male, "St. Peters, Mo., Oct. 23, H. E. Roberts, Collector"; 1 male, 1 female, "Sioux City, Ia."; 2 males, 1 female, "Sioux City, Ia. 29/4"; 2 females, "Sioux City, Ia. 8/7"; and 1 female, "Iowa City, Iowa, IV.16, Wickham."

REMARKS AND COMPARATIVE NOTES. Sometimes the females of this species have been determined as *L. inaequalipennis* (Boh.). They may be distinguished from *L. inaequalipennis* (Boh.), a synonym of *L. squamiger* (Say), by the lack of the peculiar development of the elevated flaps of the seventh abdominal sternum of that species. Other specimens have been determined as *L. callosus* LeConte, from which they may be separated by the less deeply emarginate base of the elytra and the less prominent posterior calli. The elytral intervals are also less convex, and there are usually prominent transverse wrinkles of the elytra which are not present in *L. callosus* LeConte. These species may be easily separated by an examination of the internal genitalia.

The tips of the elytra of the male are usually conjointly rounded. Two male specimens have been found, one from Albert Lea, Minn., and the other from Iowa City, Iowa, in which there is a short tubercle at the apex of each elytron, suggesting a slight development of the long cylindrical process which is characteristic of the female of this species.

The range of this species is now known to include California, Oregon, and British Columbia. There are variations in some of the specimens from the new localities, and these will be discussed in some detail to avoid possible confusion. In a series of specimens from Oregon, most of them from Dalles, the most noticeable differences have been found. The most apparent variation is that of the shorter processes found on the tips of the elytra of some of the females. In one of the specimens the elytra are but slightly more than acuminate at the apex. In othes specimens the processes are longer, but not quite as long as is typical of the species. Still others are entirely normal. In some of the specimens the beak is a little thicker and is more strongly curved on the upper surface. In these individuals the beak is usually distinctly tricarinate, the median carina being narrow, sharp, and smooth, the lateral carinae broader and rather densely punctate. The anterior half of the disk of the pro-

thorax often has a fine median carina. There is sometimes a slight granulation of the surface of the prothorax, giving it a rough appearance, the rougher sculpture being more apparent on the sides than on the disk. An examination of the sclerotized portion of the eighth sternum of the female shows that the basal piece is sometimes shorter than usual, but that the shape of the terminal arms is typical. The extent of the modification of some of these individuals might suggest the possible existence of a variety or even a geographic race. After careful consideration, the conclusion has been reached that it would not be wise to give such rank to these specimens, at least in the light of present information, and with the small number of specimens available. During the course of the examination of a large number of individuals of this species from the eastern states, tendencies toward all of these modifications have been noticed. There are often faint traces of a median prothoracic carina, and in some cases the carina is rather strongly developed. The sides of the prothorax are often rough or granulate, and the punctation of the disk is variable. In some cases the beak has only a median carina, but many times the lateral carinae are well developed. An indication of the variation of the elytral processes has already been given in the description of the species. Specimens from other localities which are in the outer limits of the range of the species may show various degrees of development of one or more of the variable characters mentioned, so that we have some intermediate forms between the typical condition found in the northeastern states and the conditions found in some of the specimens from Oregon. There is a female from Creston, British Columbia, less than five miles above the Idaho line, in which the caudal processes of the elytra are very short; the beak is not thickened, and the lateral carinae are present but not strongly developed; the basal piece of the eighth sternum is moderately long. A male from Nevada has been seen which is typical in all respects. Two females from Dry Lake, Utah, have the lateral carinae of the beak very prominent and the prothorax somewhat granulate on the disk and rough on the sides; the caudal processes of the elytra of these specimens are typical, and the basal piece of the eighth sternum is long. A male seen from Salt Lake, Utah, is normal in all respects. Females from Colorado and Texas have been examined which were typical in all respects. A male from Texas has the transverse wrinkles of the elytra very prominent; the disk of the prothorax has more large open punctures than usual, and there is a slight constriction of the sides at about the middle. There are sometimes lesser indications of this constriction

in other specimens. It seems plausible to assume that the atypical Oregon specimens are merely individuals at the extreme limits of the range of the species, in which there is an unusual amount of variation, when we consider that there are tendencies toward these same variations in some individuals in the eastern states, that there are some intermediate forms in the intervening territory, and that not all the specimens from Oregon exhibit variation to the same extent, some of them being entirely normal.

BIOLOGICAL NOTES. This species has been recorded as having been taken on several different plants, and a number of new records are given here. A great variety of plants are included on the list, and it is doubtful that all of them are actual food plants. The beetles may have been only resting on some of the listed plants at the time they were taken.

Beutenmüller (1890 and 1893) states that F. M. Chittenden found the species with *L. tuberosus* LeConte and *L. appendiculatus* (Boheman) while sweeping a small patch of aquatic plants composed entirely of Sagittaria and Carex. It was recorded by Popenoe (1878) from Topeka, Kan., as occurring with *L. nebulosus* LeConte on Sagittaria. The record of *L. nebulosus* LeConte in this case is probably based upon a male specimen of *L. caudatus* (Say). Popenoe states this his specimens were determined by LeConte, and I have seen a male of *L. caudatus* (Say) from Topeka, Kan., which not only bears the label of *nebulosus* in LeConte's own handwriting, but it is one of the rare labels which states that the determination was made by LeConte. Blatchley and Leng (1916) state that the species has been recorded from the mild smartweed, *Polygonum hydropiperoides* Michx., and on arrowhead. Bleasdell (1937) states that two specimens of *L. caudatus* (Say) were taken by Mr. Sooter on a species of Scirpus at Lost Island, Ruthven, Iowa.

The following are the new records: on oak sprouts, May 13, at Oregon, Illinois; taken on jointgrass by G. Stace Smith at Creston, British Columbia, on July 12; taken on corn at Meredosia, Ill., by H. E. Roberts; taken on dock at night by F. A. Fenton, at Lafayette, Ind., May 22; taken on hickory at the same locality by Satterthwait, on June 21.

The species is often taken at light. It was found under a log on July 8, at Amora, Ill. McElfresh found a number of specimens at Urbana, Ill., around stumps in overflowed land in April.

DATA ON DISTRIBUTION. Blatchley and Leng (1916), give the following information as to the distribution of this species: "Frequent throughout Indiana, May 25-October 12; mating June 20.

Dorchester and West Roxbury, Mass., April 18-August 17. Ranges from Canada, New England and District of Columbia, west to Iowa and Missouri." The range of this species is now known to extend to Oregon and California, including the intervening territory. I have examined specimens from the following localities:

UNITED STATES

Massachusetts:

Mas.; Mass.; Chicopee, Mass.; Chicopee, Mass., Apr. 18, '99, June 9, '96, and July 22, '96; Chicopee, M., June 20, '95; Chicopee, Mass., VII.11; Cambr., 20.2.74; Boston, Mass., IV.9.02 and IV.12.02, H. M. Parshley; Springfield, Mass., Geo. Dimmock; Low., Mass.; Brookline, Mass.; Needham, Mass.; Arlington, Mass., II-20-25; Wayland, Mass., III-13-25 and IV-27-24; Dorchester, Mass., 9-VII-'03, Jul. 25, 1903, Aug. 17.1903, and 10-VII-'03; W. Roxbury, Mass., Apr. 18.1909, Bolster.

Rhode Island:

Watch Hill, R. I., July 31, 1909, W. Robinson.

New York:

N. Y.; Rosedale, L. I., N. Y., IV.22.1923, Collector, A. Nicolay; New York, N. Y., Chittenden Collector; N. Y. City & vcty.; Buffalo, N. Y.; Ithaca, N. Y.; Ithaca, N. Y., Chittenden Collector; Ithaca, N. Y., 23 Sept., '89.

New Jersey:

N. J.; Arlington Mdws., N. J., IV.10.1926, A. Nicolay; No. Arlington, N. J., III-26, IV-10, and XI-7; Arlington, N. J.; Blmfield, N. J.; Milburn, N. J.; Slt. Mdows., N. J., III-17; Slt. Mdows., N. J.

Maryland:

Pr. Geo. Co., Md., 5/12/14, G. W. Barber Coll.; Cupid Bower Isl., nr. Grt. Fl., Md., 6 Aug., 1927, H. S. Barber.

District of Columbia:

Washington, D. C., VI-22-23, J. R. Greeley Coll., at light; Washington, D. C., 6.3, Chittenden Collector, light; Washington, D. C., June 19, '95, Chittenden Collector; Eastern Branch, Washington, D. C., H. S. Barber; Rock Creek, D. C., 19.5.1911, F. A. McDermott.

Virginia:

Alex. Co., Va., June 14, 1910, Wm. T. Davis; Arlington Marsh, opp. Wash., D. C., June (?), 1928, J. C. Bridwell.

Pennsylvania:

Pen.; Philadelphia, Pa., VII.27.16; Pa.; Phila. Neck, Pa., 6-14 and 6.24, H. W. Wenzel Collector.

Ohio:

Ohio; Toledo, O.; Summit Co., Ohio, 6-13-1934, Louis J. Lipovsky; Cincinnati, Ohio, VII-22; Columbus, O., 7-15-14, 8-15-14, 8-19-14, and 8-29-14, V. R. Haber Collector; Columbus, O., VII-20-35, J. N. Knull Coll.; Erie Co., O., VII-10-03.

Indiana:

Ind.; Terre Haute, Indiana; Lafayette, Ind., V.22.'16, F. A. Fenton collector, On Dock at night; Lafayette, Ind., VI.21.'15, Satterthwait Collector, Hickory leaf; Miller, Ind., VII-3-15; Millers, Ind., VII-3-15, Selingen; Hessville, Ind., VII:1:11, Col. by W. J. Gerhard, At Light; Millers, Ind., VII-9, Liljeblad Collector.

Michigan:

Mich.; Washtenaw Co., Mich., Ann Arbor, VI-19-1919, M. H. Hatch; Port Huron, Mich., June; Monroe, Mich.; S. Haven, Mich., 15.9; Washtenaw Co., Mich., VI-17-1921, M. H. Hatch; Detroit, Mich.; Oakland Co., Mich., IX-3-1921, M. H. Hatch; Cheboygan Co., Mich., 7-14-1936; Douglas Lake, Mich., July 24, 1923, H. B. Hungerford; Cheboygan Co., Mich., 7-29-1936, David M. Gates, Shore of Douglas Lake; Ludington, Mich., VII:13:32, Col. & pres. by E. Brundage, Jr.

Wisconsin:

Wis.; Bayfield, Wis., Wickham; Cranmoor, Wis., VI.18.10, C. W. Hooker Collector; Holcombe, Wis., Bufo am. 2353 (July 28, 1918, A. I. Ortenburger); Victory, Wis., July 29, 1927, F. M. Uhler.

Minnesota:

Min.; Minn.; Albert Lea, Minn., July 12, 1923, D. R. Hylan Collector; Albert Lea, Minn., July 12, 1923, C. C. Sperry Collector; Duluth, Minn.; St. Anth. Park, Minn., 7/4, 14/4, and 4/7; St. Anthony Park, Minn., 5/20; St. Anthony Pk., Minn., 5.VII.1923 and 10-VII.1921, H. H. Knight, collected at light; Albert Lea, Minn., July 10, 1923, P. L. Keene, at light; Wabasha Co., Minn.; Ramsay Co., Minn.; Ramsey Co., Minn., June 15, 1923, Wm. E. Hoffman, U. Farm lights; Ramsey Co., Minn., June 15, 1923, Wm. E. Hoffman, U. Farm lights; Ramsey Co., Minn., VIII-1-1924, H. H. Knight; Ramsay Co., Minn., 7-6, 1923, R. W. Dawson; Ramsey Co., Minn. Powder Plant woods, August 24, 1922, Clayton Johnson; Ramsey Co., Minn., Oak forest, July 5, 1929, 5 p. m., R. E. Wall; St. Paul, Minn., University Farm., June 24, 1932, light trap, A. A. Granovsky; St. Paul, Minn., June 23, 1936, July 2, 1935, July 20, 1935, and Aug. 5, 1935, U. Farm light trap, A. A. Granovsky; Ottertail Co., Minn., 7-15-12; Houston Co., Minn., May 25, 1936, Robert Cottrell Collector.

Illinois:

N. Ill.; N. Ill., July; Pekin, Ill., Aug., 1882; Peoria, Ill., Aug. 11, '95; Cook Co., Ill., Aug., Blackwelder; Cook Co., Ill., Col. & pres. by E. B. Chope; Chicago, Ill., VII:1, Col. by W. J. Gerhard, Light; Chicago, Ill., IX:12:06, Col. by E. B. Chope; Chicago, Ill., 3/9; Chicago, Ill., Chittenden Collector; Roby, Ill., IX:7:06, Col. by E. B. Chope; Meredosia, Ill., VIII.8.23, H. E. Roberts Collector, Corn; Havana, Ill., VIII.19.07; Lake Forest, Ill., 6-VIII-1906, J. G. N.; Urbana, Ill., Apr. 7, 1892, and Apr. 11, 1892, McElfresh, around stump in overflowed land; Urbana, Ill., Jan. 1, 1889, and Apr. 5, 1885; Urbana, Ill., Jul. 1, '07, at light; Beach, Ill., lake shore, Aug. 24, '06; Aurora, Ill., July 17, 1927, at light, Coll. T. H. F. and R. D. G.; Aurora, Ill., Jul. 8, '08, under log; Oregon, Ill., May 13, '15, on oak sprouts; E. St. Louis, Ill., June 26, 1931, Frison, Betten & Ross.

Iowa:

Iowa; Sioux City, Ia.; Sioux City, Ia., 26.III.89; Sioux City, Ia., 29/4 and 8/7; Iowa City, Iowa, IV.16, Wickham; Iowa City, Ia., 4-23-'16, L. Buchanan; Iowa City, Wickham; Iowa City, Ia., VI.7.1895; Iowa City, Wickham, III-25-98; Iowa City, Wickham, III.28; Iowa City, Ia., V-16-'13, Stoner; Iowa City, Ia., IV.23.1895; Des Moines, Iowa, VII-15-'14, D. Stoner; Keokuk, Iowa, June, Shaffer; Muscatine, Ia., 4-21-19, F. M. Wadley Collector; Lake Okoboji, Ia., July 24, 1917, L. L. Buchanan; Cedar Rapids, Ia., Shimek; Solon, Iowa, 4-23-'15, Buchanan; Ames, Iowa, VII-7-'13, D. Stoner; Oskaloosa, Iowa; Iowa, Bufo 2052 (Lost Island Lake, Clay County, July 26, 1918, A. G. Ruthven).

Nebraska:

Nebraska City, Nebraska; Neb.

Missouri:

Mo.; St. L., Mo.; St. Peters, Mo., Oct. 23, H. E. Roberts Collector.

Kansas:

Ks.; Kan.; Topeka, Ks., Popenoe; Topeka, Kan., Jul. 19, Popenoe; Riley Co., Ks., Jun. 23, Popenoe; McPherson, Kansas, July; Lawrence, Ks., 8-8-1933, Wm. D. Field; Lawrence, Kan., 6-22-33, Jack Penfold; Lawrence, Kan., May, 1933, D. Lewis; Lawrence, Ks., 22.VI.1922, C. H. Curran; Doug. Co., Ks., 7-2-35, Chas. Amyx; Lawrence, Kas., 7-13-35, L. S. Henderson, at light; Douglas Co., Ks., 6-22-33 and 6-22-34, L. S. Henderson; Lawrence, Kansas, 6-21-33, L. S. Henderson, at light; Lawrence, Kas., 6-17-36, L. S. Henderson, Collected at light; Leavenworth Co., Kans., 6-22-33, L. S. Henderson, trap light; Kan., T. B. A.

Arkansas:

Ark.

Texas:

Texas; Dallas, Tex., 26.6, H. S. Barber Collector.

Colorado:

Col.

Utah:

Dry Lake, Ut., 7/31/1926, G. F. Knowlton Collector; Salt Lake, Utah, C. N. Ainslie Collector.

Nevada:

Nev.

Oregon:

Or.; The Dalles, Oreg.; Dalles, Or.; Dalles Ore., Chittenden Collector.

California:

Sta. Rosa, Cal., 6.13.

CANADA

Quebec:

Montebello, Que., VIII-3-37; Berthier, Que., 5/30/21.

Ontario:

E. Ont.; Toronto, Ont., R. J. Crew; Ottawa, Can., Rockcliffe Park, 2.X. 1907, C. H. Young; Pt. Pelee, Ont., 5.VI.1929, L. J. Milne; Co. Prince Edw'd., Ont., Can., 1.7.96. Evans; Ottawa, 25.5.96.

British Columbia:

Creston, B. C., 12-VII-1926, G. Stace Smith, Jointgrass.

Listronotus ingens new species

(Plate XXXI, figs. 2, 2a; Plate XXXVII, fig. 4)

Length, 11 to 13.5 mm. Large, oblong, stout. Body black. Head, beak, median half of disk of prothorax, middle of thoracic sterna and all of abdominal sterna rather thinly clothed with very narrow scales or setae which are brownish-cinereous, sometimes with a slight cupreous tinge; sides of prothorax and elytra clothed with small, rounded, dull-brown scales. Sixth and seventh intervals of elytra sometimes with mottlings of cinereous scales, or rarely almost entirely light-colored from humeri to apical third of elytra; occasional small scattered patches of lighter scales on basal half of sides of elytra. *Beak* slightly longer than prothorax, moderately stout, very slightly curved in male, more strongly curved in female; usually rather strongly tricarinate; median carina always prominent and sharp; lateral carinae more rounded, always present but occasionally less pronounced; lateral sulci present but rather broad and shallow; finely and densely punctate. *Head* strongly convex, densely punctate; frontal fovea deep, elongate, sometimes continuing upward for a short distance onto the head as a sharp, narrow sulcus. When viewed from the side there is usually a rather pronounced impression at the point of the frontal fovea, between the convex head and the base of the curved upper surface of the beak. *Antennae* with second segment of funicle not quite twice as long as first; third segment elongate, longer than fourth, and about the same length as the first; seventh segment more closely united with the club than in the other species of this group. *Prothorax* one-fifth wider than long; ocular lobes not very strongly developed; sides broadly rounded, widest slightly beyond the middle; apex truncate, base slightly curved, basal angles rounded; disk convex, densely but very shallowly punctate; median half of disk clothed only with very slender scales. *Scutellum* elongate, very densely covered with minute buff-colored scales. Base of *elytra* rather deeply emarginate; humeri right-angulate or very slightly oblique, with a rather prominent angulation just behind the humeri; sides nearly parallel to apical third, then narrowed to the conjointly

rounded apices; striae fine, not strongly impressed, punctures moderate, distant; intervals slightly convex, sometimes slightly roughened by transverse wrinkles; setae very short and slender, confused on third, fifth, and seventh intervals, in a single row on the others; posterior calli scarcely evident. *Ventral surface* clothed mostly with slender scales; finely and densely punctate. *Male* with a broad, feeble, median impression across all of the third (first visible) abdominal sternum and the basal half of the fourth; seventh (fifth visible) sternum unmodified. *Female* with a somewhat triangular area at base of seventh (fifth visible) abdominal sternum devoid of punctures and scales, shining, but minutely reticulate.

NOTES ON TYPES. Holotype male and allotype female from "Okla." Ten paratypes as follows: 2 males, 1 female, "Okla."; 1 male, "Stillwater, Okla., 6-16-'30"; 1 male, "Arcadia, Tx., 5-10-35"; 1 female, "La."; 1 male, 1 female, "Kansas, Ashton Collection"; 1 male and 1 female, "Laporte Co., Ind., 6-10-01, W. S. B." Holotype and allotype in the American Museum of Natural History. Paratypes in the American Museum of Natural History, United States National Museum, Museum of Comparative Zoölogy at Harvard College, Francis Huntington Snow Entomological Collections at the University of Kansas, and in the entomological collections of Purdue University and at College Station, Texas.

REMARKS AND COMPARATIVE NOTES. This species is very closely related to *L. caudatus* (Say). The shape of the eighth sterna of the females is very much the same, but there are slight differences which are constant and specific in nature. The females of the two species may be easily separated by the absence of the caudal processes of the elytra in *L. ingens* n. sp. The male genitalia of the two species are very distinct. *L. ingens* n. sp. may be recognized by the setae on the median half of the prothorax, by the strongly tricarinate beak, and the deep frontal fovea. *L. caudatus* (Say) has a few slender scales along the median line of the disk of the prothorax, but they are not hairlike and do not extend laterally beyond the median line. The following external characters will be found of value in separating *L. ingens* n. sp. from *L. caudatus* (Say): beak more strongly curved and the lateral carinae more distinct; frontal fovea deeper; scales on median half of disk of prothorax more hairlike; larger punctures bearing dark, stout, semierect setae very sparse or absent; sides of prothorax more rounded; humeri a little more oblique, elytra smoother, sometimes with mottlings of cinereous scales; ventral surface with fewer rounded scales, almost none on the fourth (second visible) abdominal sternum.

DATA ON DISTRIBUTION. Although this species is represented by only a few known individuals and is apparently very rare, at least in collections, it has a rather wide range. Specimens have been examined from Indiana, Kansas, Oklahoma, Texas, and Louisiana.

Listronotus americanus LeConte, 1876

(Plate XXXI, fig. 1; Plate XXXVII, fig. 9)

1876. *Listronotus americanus* LeConte, Proc. Am. Phil. Soc., Vol. XV, p. 131.

1916. *Listronotus americanus* LeConte. Blatchley and Leng, Rhynchophora of North eastern America, p. 157.

1920. *Listronotus americanus* LeConte. Leng, Catalogue of the Coleoptera of America North of Mexico, p. 316.

1931. *Listronotus americanus* LeConte. Schenkling and Marshall, *in* Junk, Coleopterorum Catalogus, Subfam. Cylindrorrhininae, Pars 114, p. 11.

ORIGINAL DESCRIPTION. "Blackish, covered with round, dirty-brown scales, becoming larger on the prothorax, less dense and hair-like upon the head and beak. Beak as long as the prothorax, strongly carinate and sulcate. Prothorax scarcely as long as wide, rounded on the sides, narrowed before the middle, constricted towards the tip; marked with two sinuous lateral vittae, and a scarcely distinct dorsal line of pale scales. The punctures are less concealed by scales than in the species above described [*L. caudatus* (Say)], and are very coarse and dense. Scutellum pale. Elytra strongly emarginate at base, humeri oblique, sides then parallel, rounded behind; the posterior callus is distinct, not very prominent; the elytra are compressed at the suture towards the tip, and vertically declivous; the striae are strongly punctured, the interspaces somewhat uneven; there is an indistinct broad stripe commencing at the humeri and running backwards on the sixth, seventh, and eighth interspaces, and there are besides some irregular mottlings of pale scales. Beneath punctured, irregularly spotted with large pale scales; thighs with a pale band. Length, 14 mm.; .55 inch.

"Female. Last ventral deeply concave, the excavation smooth at the bottom, and transversely impressed with a short line, becoming narrow at the tip, which is deeply emarginate; the upper marginal line is continued around the tip, separate from the lower one, and the space between them is curiously and deeply marked with two excavations on each side near the extreme emargination; pygidium strongly emarginate; tips of the elytra separately rounded. Male wanting.

"Georgia, three specimens. I have seen nothing similar to the curious sculpture of the last ventral segment, though in its homology it is only a modification and complication of the forms mentioned

under other species. It is the *Eudocimus americanus* Dej. Cat. 299, but bears no resemblance to *Eu. mannerheimii*."

ADDITIONAL DESCRIPTION. *Length*, 10.5 to 14 mm. *Beak* slightly longer than the prothorax, tricarinate; median carina sharp and smooth, lateral carinae broader, more rounded, and punctate; there is a very distinct deep lateral sulcus on the basal half of the beak; upper surface rather coarsely punctate, slightly rugose on sides and on the head between the eyes; frontal fovea rather deep. *Antennae* slender; second segment of funicle about twice as long as first; third segment distinctly longer than fourth, about the same length as the first; seventh segment enlarged and rather closely joined to the club. Disk of *prothorax* slightly wider than long; ocular lobes moderately developed. The base of the *elytra* is more deeply emarginate in this species than in any other, causing the humeral angle to be rather oblique; anterior margin along first five elytral intervals somewhat elevated; the basal region of the tenth and eleventh intervals directly beneath the humerus is impressed, giving a sharp and rather prominent appearance to the humeri when viewed from the front; alternate intervals slightly more convex; transverse wrinkles give a rough appearance to the elytra. *Legs* rather long; tibiae with a rather stout mucro and a fringe of long, yellow hair on the extreme apical portion along the inner or lower margin. *Male* with tips of elytra conjointly rounded and seventh sternum broadly convex in the anterior half.

NOTES ON TYPES. LeConte described this large and interesting species from three females which he stated were from Georgia. These specimens have been examined. Two are in the LeConte collection in the Museum of Comparative Zoölogy at Harvard College and the other is from the Horn collection and is in the collection of the American Entomological Society in the Philadelphia Academy of Natural Sciences. All three of these specimens bear the orange disk of colored paper which LeConte used to indicate the "southern states."

BIOLOGICAL NOTES. Nothing is known of the biology of this species. Dr. H. P. Löding of Mobile, Ala. (*in litt.*, Jan. 24, 1936), says: "I have taken *L. americanus* here, but it seems extremely rare, or at least hard to find. I have not so far been able to associate the species with its food plant."

DATA ON DISTRIBUTION. Only seven specimens of this species have been seen. There is a female in the United States National Museum from the collection of Bovie, bearing the label "Patrie?."

There is a large male from Florida in the collection of Mr. H. C. Fall. Dr. H. P. Löding has a pair from Alabama. The available records follow:

Georgia:

Georgia.

Florida:

St. Augustine, Fla.

Alabama:

Dog River, Ala., IV.14.32; Springhill, Ala., XII.18.27.

Listronotus callosus LeConte 1876

(Plate XXXIV, fig. 4; Plate XXXVI, fig. 6)

1876. *Listronotus callosus* LeConte, Proc. Am. Phil. Soc., Vol. XV, p. 130.

1885. *Listronotus callosus* LeConte. Townsend, Can. Ent., Vol. XVII, p. 72.

1903. *Listronotus callosus* LeConte. Ulke, Proc. U. S. N. M., XXV, p. 33. (Name cited in error.)

1906. *Listronotus callosus* LeConte. Evans, Can. Ent., Vol. XXXVIII, p. 100. (Name cited in error.)

1910. *Listronotus callosus* LeConte. Smith, The Insects of New Jersey, p. 382. (Name cited in error.)

1911. *Listronotus callosus* LeConte. Mitchell and Pierce, Proc. Ent. Soc. Wash., Vol. XIII, p. 50.

1916. *Listronotus callosus* LeConte. Blatchley and Leng, Rhynchophora of North Eastern America, p. 155.

1920. *Listronotus callosus* LeConte. Leng, Catalogue of the Coleoptera of America, North of Mexico, p. 316.

1925. *Listronotus callosus* LeConte. Leng, Cornell Univ. Agri. Exp. Sta., Memoir 101, p. 495. (Name cited in error.)

1931. *Listronotus callosus* LeConte. Schenkling and Marshall, *in* Junk, Coleopterorum Catalogus, Subfam. Cylindrorrhininae, Pars 114, p. 11.

1937. *Listronotus callosus* LeConte. Bleasdell, Iowa St. Coll. Jr. Sci., Vol. XI, No. 4, p. 445.

ORIGINAL DESCRIPTION. "Blackish, densely clothed, as in the other species, with small, rounded scales, becoming larger on the prothorax, and hairlike upon the head, they are dirt-colored on the general surface of the body, but pale at the sides of the prothorax and elytra, and on a narrow dorsal vitta of the former. Beak as long as the prothorax, distinctly carinate and sulcate, prothorax scarcely as wide as long, broadly rounded on the sides, gradually narrowed in front of the middle, marked as usual with scattered black dots. Scutellum pale. Elytra strongly emarginate at base, humeri oblique, striae strongly punctured, interspaces wide, somewhat convex; posterior callus rather prominent, oblong, fading in front into the fifth and adjoining interspaces. Beneath dirty-brown, speckled with black punctures. Length, 9-10.5 mm.; .35-.42 inch.

"Male. Last ventral segment not impressed, anal segment very slightly visible behind the last ventral.

"Female. First and second ventrals with a broad, shallow im-

pression, last ventral with a deep, round excavation extending from the base to the tip; pygidium semicircularly emarginate at tip; elytra separately subacuminate at tip.

"New York to Georgia. The posterior callus of the elytra is about as prominent as in *L. squamiger,* but not so narrow."

ADDITIONAL DESCRIPTION. *Length,* 8-11 mm. Median carina of *beak* sharp, distinct; lateral carinae more rounded and less prominent than median carina; beak slightly longer than prothorax. There is a rather deep sulcus between the lateral carina and the scrobe of the antenna, beginning at the base of the beak. This sulcus becomes less deep as it extends forward and becomes obsolete slightly beyond the middle. Disk of *prothorax* one-fifth wider than long; ocular lobes moderately developed. The scattered black dots of the prothorax mentioned in the original description are the scattered larger punctures which are open and bear setae instead of scales. The depression of the seventh abdominal sternum of the *female* is transverse rather than rounded. Although the depression is usually deep there are occasional specimens with a rather shallow impression.

NOTES ON TYPES. The types of this species have been examined. They are located in the LeConte collection in the Museum of Comparative Zoölogy at Harvard College. There are two specimens at the head of the series which bear type labels. The first is a male and the second is a female. They both bear the pink disk which LeConte used to indicate the "middle states." These two specimens agree with LeConte's description of the species. There are three additional specimens in the series, all *L. squamiger* (Say). The first of these specimens is from "Can.," and since Canada is not mentioned in the original description, this specimen, and the other two labeled "N. Ill." were undoubtedly added to the series at some later time. LeConte gives New York to Georgia as the range of *L. callosus* LeConte. The New York record is undoubtedly based upon a misidentification. I do not know where the types were collected, but they probably came from some locality north or west of Georgia, since Georgia was considered by LeConte as a southern state and the types are said to come from the "middle states." I have seen representatives of this species from only as far north as South Carolina.

REMARKS AND COMPARATIVE NOTES. One male specimen was found which bears the label "*Listroderes squamiger* Say, Lec./74." This label was written two years before the present species had been described. Male specimens of *L. caudatus* (Say) are frequently

found which have been determined as *L. callosus* LeConte. The latter species may be distinguished from *L. caudatus* (Say) by the more deeply emarginate base of the elytra and the more prominent posterior calli. The elytral intervals are more convex and are without the transverse wrinkles which are present in *L. caudatus* (Say). Some of the large representatives of *L. sordidus* (Gyllenhal) are very similar to *L. callosus* LeConte; however, in the latter the base of the elytra is a little more emarginate and the humeri are more acute, the posterior calli of the elytra are less pronounced, the beak is heavier and thicker, and the median carina is stronger. In the females the two species may be easily separated by the caudate elytra of *L. sordidus* (Gyllenhal).

BIOLOGICAL NOTES. Nothing is known of the life history or food plant of this species. It has been recorded by Townsend (1885) as having been taken in some numbers with *L. tuberosus* LeConte, *L. nebulosus* LeConte, and *L. frontalis* LeConte under old railroad ties and pieces of wood in dry places during the first part of April.

DATA ON DISTRIBUTION. The distribution of this species as given by LeConte in the original description has already been discussed in the paragraph concerning types. Blatchley and Leng (1916) add Ontario, District of Columbia, New Jersey, Michigan, Illinois and Louisiana. All these records, except the one for Louisiana, are erroneous, since the species does not extend into any of the northern states. The northern records for this species are based on misdeterminations, the confusion probably being with *L. caudatus* (Say) and *L. squamiger* (Say), representatives of both having been found determined as *L. callosus* LeConte. Mitchell and Pierce (1911) record the species as having been collected by Walker in Victoria county, Texas, June 18, 1904.

The center of population of this species seems to be in Louisiana, the great majority of the specimens examined having come from there. A few specimens have been seen from other states. Material has been examined from the following localities:

South Carolina:
So. Carolina.
Georgia:
Geo.
Alabama:
Ala.
Louisiana:
Louisiana; La., Horn, 7/10/73; New Orleans, La., 28/2/93 and 26.X.91; New Orleans, La., 11/3, 26/3, 6/6, and 10/6; New Orleans, 11/3.
Texas:
Tex.; Willis, Tex., '03.

Listronotus squamiger (Say) 1831

(Plate XXXV, fig. 3; Plate XXXVI, fig. 4)

1831. *Listroderes squamiger* Say. Desc. n. sp. Am. Curculionites, p. 11.

1834. *Listroderes squamiger* Say. Gyllenhall, *in* Schönherr, Genera et Species Curculionidum, II, 1, p. 279.

1835. *Curculio* (*Listroderes*, Sch.) *reticulatus* Harris. Harris, Catalogues of the Animals and Plants of Massachusetts, p. 49. (*Nomen nudum.*)

1842. *Listroderes squamiger* Say. Boheman, *in* Schönherr, Genera et Species Curculionidum, VI, 2, p. 189.

1842. *Listroderes inaequalipennis* Boheman, *in* Schönherr, Genera et Species Curculionidum, VI, 2, p. 189.

1853. *Listroderes squamiger* Say. Melsheimer, F. E., Catalogue of the described Coleoptera of the United States, p. 95.

1859. *Listroderes squamiger*, Say. Complete Writings of Thomas Say, ed. LeConte, Vol. I, p. 271.

1871. *Listroderes squamiger* Say. Gemminger and Harold, Catalogus Coleopterorum, VIII, p. 2361.

1871. *Listroderes inaequalipennis* Boheman. Gemminger and Harold, Catalogus Coleopterorum, VIII, p. 2360.

1873. *Listroderes squamiger* Say. Crotch, Check List of the Coleoptera of America, North of Mexico, p. 118.

1873. *Listroderes inaequalipennis* Boheman. Crotch, Check List of the Coleoptera of America, North of Mexico, p. 118.

1876. *Listronotus squamiger* (Say). LeConte, Proc. Am. Phil. Soc., XV, p. 130.

1876. *Listronotus inaequalipennis* (Boheman). LeConte, Proc. Am. Phil. Soc., XV, p. 131.

1878. *Listronotus squamiger* (Say). Popenoe, Trans. Kan. Acad. Sci., VI, p. 85.

1889. *Listronotus squamiger* (Say). Townsend, Psyche, V, p. 234.

1893. *Listronotus squamiger* (Say). Beutenmüller, Jr. N. Y. Ent. Soc., I, p. 40.

1895. *Listronotus squamiger* (Say). Hamilton, Trans. Am. Ent. Soc., XXII, p. 344.

1895. *Listronotus inaequalipennis* (Boheman). Hamilton, Trans. Am. Ent. Soc., XXII, p. 344.

1903. *Listronotus inaequalipennis* (Boheman). Evans, Can. Ent. XXXV, p. 319.

1903. *Listronotus inaequalipennis* (Boheman). Ulke, Proc. U. S. N. M., XXV, p. 33.

1910. *Listronotus squamiger* (Say). Smith, Insects of New Jersey, p. 382.

1910. *Listronotus inaequalipennis* (Boheman). Smith, Insects of New Jersey, p. 382.

1916. *Listronotus squamiger* (Say). Blatchley and Leng, Rhynchophora of North Eastern America, p. 155.

1916. *Listronotus inaequalipennis* (Boheman). Blatchley and Leng, Rhynchophora of North Eastern America, p. 156.

1920. *Listronotus inaequolipennis* (Boheman). Britton, Conn. Geol. and Nat. Hist. Surv., Bull. 31, p. 283.

1920. *Listronotus squamiger* (Say). Leng, Catalogue of the Coleoptera of America, North of Mexico, p. 316.

1920. *Listronotus inaequalipennis* (Boheman). Leng, Catalogue of the Coleoptera of America, North of Mexico, p. 316.

1925. *Listronotus inaequalipennis* (Boheman). Hatch, Papers, Mich. Ac. Sci., IV, 1, p. 584.

1928. *Listronotus squamiger* (Say). Leng, C. W., Cornell University Agricultural Experiment Station, Memoir 101, p. 495.

1928. *Listronotus inaequalipennis* (Boheman). Leng, C. W., Cornell University Agricultural Experiment Station, Memoir 101, p. 495.

1931. *Listronotus squamiger* (Say). Schenkling and Marshall, *in* Junk, Coleopterorum Catalogus, Subfam. Cylindrorrhininae, Pars 114, p. 12.

1931. *Listronotus inaequalis* (Boheman). Schenkling and Marshall, *in* Junk, Coleopterorum Catalogus, Subfam. Cylindrorrhininae, Pars 114, p. 11.

1937. *Listronotus squamiger* (Say). Bleasdell, Iowa State College Journal of Science, XI, No. 4, p. 415.

1937. *Listronotus inaequalipennis* (Boheman). Bleasdell, Iowa State College Journal of Science, XI, No. 4, p. 416.

ORIGINAL DESCRIPTION. "Body covered with minute brownish cinereous scales: rostrum with a carinate line; thorax with scattered punctures; not flattened; scutel yellowish or whitish, elytra with punctured striae towards the tip concealed by the scales; the united tip obtusely rounded; humeri obtuse.

"Length, from two-fifths to half an inch.

"Inhabits Arkansaw.

"Much like *caudatus,* but in that species the humeral line is carinate and acute."

ADDITIONAL DESCRIPTION. *Length,* 7.5 to 10 mm. Elongate-oblong, black. Densely covered with dark brown or fuscous scales, sometimes with a slight cupreous tinge, especially on the head and sides of the elytra; thorax with an oblique stripe of pale scales on each side, continuing posteriorly onto the elytra as a very small humeral spot; median thoracic vitta sometimes entire, usually interrupted at middle, and sometimes only very faintly indicated. *Beak* moderately stout, equal in length to the prothorax, slightly thicker and with upper surface more strongly curved in female than in male; median carina distinct and sharp, but fine; lateral carinae absent and lateral sulci faint; surface finely and densely punctate, rather thickly clothed with small, slender scales. Second segment of funicle of *antenna* about twice as long as first, third segment longer than fourth. *Head* finely and very thickly punctate, covered with small, elongate scales; frontal fovea moderately impressed. Disk of *prothorax* slightly wider than long; ocular lobes well-developed; sides of prothorax nearly straight, slightly constricted at apex, basal angles rounded; base slightly arcuate; disk densely punctate, each puncture covered by a rounded, striate scale; a few scattered punctures larger, open, bearing coarse brown semierect setae. *Scutellum* elongate, thickly covered with light, slender scales. *Elytra* emarginate at base; humeri rounded; sides parallel to apical third, then converging to apex; odd intervals elevated and usually connected by transverse wrinkles which vary greatly with different individuals in the number and degree of convexity; elytra thickly clothed with small fuscous scales; third, fifth, and seventh intervals with several confused rows of coarse, brown semierect setae, other intervals with a single row; striae fine, remotely punctate, each puncture bearing a very short slender seta; posterior calli of elytra not very prominent. *Ventral surface* with sides of mesosternum and the mesothoracic pleurites very sparsely clothed with a few rounded scales and some slender setae; sides of metasternum densely covered

with scales, the median area with rather short, slender setae. *Legs* densely squamose and setose, femora with a preapical spot of lighter scales on outer side. *Male* with abdominal sterna densely punctate, third sternum more sparsely punctate than the others; intervals between the punctures shining and very minutely reticulate; large and small punctures intermixed, especially on the last three visible sterna, the small punctures bearing short, slender, decumbent setae, the larger punctures bearing long, coarse, semierect setae; squamose areas only on the sides of the third and fourth abdominal sterna; a rather broad, deep, median impression on the third abdominal sternum and the basal half of the fourth. Terminal spur on hind tibia broad, flattened, somewhat spoon-shaped. Apex of elytra conjointly rounded. *Female* with abdominal sterna more finely and densely punctate than in the male, but also having the surface shining and minutely reticulate; third abdominal sternum with short setae at base and in small depressed median area toward the apex, the rest of the sclerite squamose; fourth abdominal sternum squamose over its entire surface; fifth and sixth abdominal sterna with small lateral squamose areas; seventh abdominal sternum with two strongly elevated folds toward the tip, each inclined posteriorly, beginning at the posterior corners of the sclerite and extending cephalo-mesad to about the middle of the sclerite, but not meeting; the median part of the sclerite, anterior to the area enclosed by the lateral folds is shining and impunctate, but minutely reticulate. The seventh tergum is somewhat prolonged into a subacuminate tip which projects ventrally between the tips of the elytra and the last visible sternum, reaching a little beyond the level of that sclerite and a very short distance into the space between the lateral folds. The apical spur of the hind tibia is rather broad and stout, and somewhat flattened. There is a blunt tooth near the base of the spur and nearly at right angles to it. The tooth is quite variable in its extent of development, sometimes becoming approximately the same size as the main spur and in these cases the effect is to produce a spur with a bifid tip. The tips of the female elytra are usually separately subacuminate. In some individuals the tips of the elytra are prolonged into caudate processes such as are found in *L. caudatus* (Say). All degrees of development are found between these two extremes. Specimens examined which have exhibited the caudate condition of the elytra have usually been from New Jersey and the District of Columbia.

NOTES ON SYNONYMY. *Listronotus inaequalipennis* (Boheman)

has been found to be a synonym of *L. squamiger* (Say), the latter name having priority by eleven years. The type of *L. inaequalipennis* (Boheman) has been examined and does not differ from *L. squamiger* (Say). The type specimen is a male. The differences upon which Boheman based the identity of the species are only individual variations. Throughout his entire description he compares the species to *L. squamiger* (Say), stating that *L. inaequalipennis* (Boheman) is "distinguished from it only by the distant transverse wrinkles of the elytra, and the more elevated alternate intervals." During the course of the examination of several hundred specimens of this species these characters have been found to be quite variable. Although Boheman's type is somewhat roughly sculptured, having rather distinct alternate intervals and transverse wrinkles on the elytra, this appearance is emphasized by the fact that the specimen has been rubbed, removing the scales from the convexities and exposing the black, shining elytra in these places.

Harris (1835), in the catalogue of the insects of Massachusetts, lists the name *reticulatus* under the genus Curculio (Listroderes, Sch.). I have seen the specimens on which this record is based, located in the Harris collection in the New England Museum of Natural History in Boston. They are *L. squamiger* (Say), and *L. reticulatus* (Harris) is a *nomen nudum,* since a description of the species was never published. Although Harris did not attribute the name to Say in the catalogue, Harris' own books indicate that *reticulatus* was a Say manuscript name in Listroderes, but this name was never published by Say.

NOTES ON TYPES. The types of this species have been lost, as have most of the other Say types. Neotypes are being designated. The species was described from "Arkansaw," and a few specimens from that state have been seen, but the greater part of the range of the species is more northern, and for this reason the types were selected from Iowa. Another reason is that the Arkansas specimens were very few and were in poor condition, while longer series of perfect and typical specimens could be secured from Iowa.

Neoholotype male and neoallotype female, "Iowa City, Iowa, IV.16, Wickham." Seven neoparatypes as follows: 1 male, "Lake Okoboji, Ia., June 23, 1917, L. L. Buchanan"; 2 males, 2 females, "Lake Forest, Ill., U. S. A., 6-VIII-1906, J. C. N."; 2 males, "Ind." Neoholotype and neoallotype in the United States National Museum. Neoparatypes in the United States National Museum and in the

Francis Huntington Snow Entomological Collections at the University of Kansas.

REMARKS AND COMPARATIVE NOTES. Reference has already been made to the caudate condition of the elytra of some females of this species. There is a limited region along the Atlantic coast between Massachusetts and North Carolina where females have been found with caudate elytra. No other difference can be detected between these females and others of the species without the prolongations of the tips of the elytra. The peculiar development of the seventh sternum is the same and the eighth sternum is the same. No difference at all can be found between males from this region and those from other localities. Specimens have been taken over a long period of years, so this is not some variation which occurred during one season and then ceased to exist. Dates of collection have ranged from March to August, excluding the possibility of seasonal effect upon development. No explanation can be offered as to the causes of this condition. Some workers might be inclined to assign a name to these caudate individuals, but until more is known of the biology of the species and the nature of the cause of this development such action would be unwise.

Most of the females seen with caudate elytra have been from Massachusetts, New Jersey, and Washington, D. C. The point farthest south is Raleigh, N. C. Females with both caudate and rounded elytra have been seen from Virgina. All females examined from the District of Columbia have had caudate elytra. Several specimens from Delaware and Philadelphia, Pa., were caudate. Some caudate females were found from Long Island, N. Y., and others were labeled only New York, but were probably from the eastern part of the state. A long series of females from New Jersey has been examined, and in this locality are found all stages of gradation from a condition in which there are long processes on the elytra to one in which the elytra are conjointly rounded.

A series of fifteen specimens has been arranged to show the gradation between the two extremes. These specimens are being designated as plesiotypes and are numbered consecutively. They will be deposited in the United States National Museum, and the series is to be kept intact.

A very few caudate females have been seen which were not from the Atlantic coastal region previously mentioned. A specimen from Marquette, Mich., has the elytra prominently acuminate at the apex. A specimen from Indiana has very short acuminate processes. An-

other individual from Aweme, Manitoba, is included as plesiotype number four in the series described in the preceding paragraph, and has elytral processes which, although distinct, are not as strongly developed as in some cases. A specimen from Ohio has prominent caudal processes.

LeConte (1876) recognized only one female of *L. squamiger* (Say) from Georgia. The males of this species were treated as *L. inaequalipennis* (Boheman). LeConte applied the name *L. inaequalipennis* (Boheman) to the females with caudate elytra. Blatchley and Leng (1916) followed LeConte in the application of the name *L. inaequalipennis* (Boheman) to the females with caudate elytra. Males were treated both as *L. squamiger* (Say) and *L. inaequalipennis* (Boheman).

L. squamiger (Say) is sometimes confused with *L. caudatus* (Say), but may be separated from it by the more rounded elytral humeri and the peculiar structure of the spurs of the hind tibiae. The female may also be readily distinguished by the structure of the last visible abdominal sternum. This species is also sometimes confused with *L. callosus* LeConte and here again it may be separated by the rounded humeri, the spurs, and the structure of the seventh abdominal sternum of the female.

A female was found from Millers, Ind., with quite a deep median longitudinal sulcus on the disk of the prothorax. The sulcus is deepest at the base of the prothorax and within it there is a rather sharp median carina, interrupted at the base and the apex.

BIOLOGICAL NOTES. This species is often attracted to light. It occurs along the margins of lakes and ponds and has been found under cover in swamps, or by sifting moss and debris in swamps. It has been reared from *Scirpus validus* Vahl., by Satterthwait. Blatchley and Leng (1916) state that the larvae live in the stems of the broad-leaved arrowhead, *Sagittaria latifolia* Willd. Beutenmüller (1893) says that according to Hamilton the larvae live in the stems of *Sagittaria variabilis*.

Specimens have been examined which had been taken from the stomach of *Bufo americanus*. The records are: Palo Alto county, Iowa, 7-5-07 and 7-16-07, A. G. Ruthven; Stevens Pt., Mellen, Wis., July 19, 1918, A. I. Ortenburger; and Harbert, Berrien county, Michigan, July 13, 1917, A. G. Ruthven. Another specimen has been examined which had been taken from the stomach of a female water snake, *Natrix sipedon*, taken at Bennings Marsh, D. C., April 22, 1917, by E. G. Holt.

DATA ON DISTRIBUTION. Described by Say from "Arkansaw." Recorded by LeConte (1876) from Georgia. Blatchley and Leng (1916) give the range as "from Quebec and New Jersey to Illinois, south to Georgia, Arkansas and Louisiana." I have seen no specimens from as far south as Louisiana. Representatives of this species have been seen from Canada, extending from Ontario to British Columbia, and from the United States from the northern, eastern, and central states, extending as far south as North Carolina, and west to Kansas, Nebraska, North Dakota and Montana. I have also seen one specimen labeled "San Francisco, California," but until additional specimens are seen, either from there, or from regions between there and the area now known to be inhabited by the species, there will be some doubt as to the authenticity of this label. Specimens have been examined from the following localities:

UNITED STATES

Massachusetts:

Mas.; Mass.; Chicopee, Mass.; Camb., 4.14; Fram'ham, Mass., V-28-26, C. A. Frost; Framingham, Mass., IV-4-26, C. A. Frost, Sifting; Sherborn, Mass., V-6-34, C. A. Frost, Sifting swamp; Sherborn, Mass., X-13-23, C. A. Frost, Sifting moss; Boston, Mass., IV.10.02 and III.30.02, H. M. Parshley; Springfield, Mass.; Cambridge, Mass., April 21, 1866, F. P. Atkinson; Mass., P. S. Sprague (*Listroderes reticulatus* Say Ms.); Cambridge, J. C. Morrill, Jr., June 5 (*Listroderes reticulatus* Say Ms.); Dorchester, Mass., 9-VII and 10-VII-'03; Dorchester, Mass., Aug. 8, '09, Bolster; W. Roxbury, Mass., Apr. 18, 1909, Bolster; Lowell, Mass.; Brookline, Mass.; Cambridge, Mass., V.5.1925, Darlington; Arlington, Mass., III.28.24, P. J. Darlington; Dorchester, Mass., June 3, 1903, July 7, 1903, July 6, 1903, and July 25, 1903.

New York:

N. Y.; N. Y. City & vcty.; Buffalo, N. Y.; Rochester, N. Y., July 23, 1933, R. L. Post; Orangeburg, N. Y., V.3.1925, A. Nicolay; Ithaca, N. Y., July 13, '16, H. Dietrich Collector; Rockaway B., L. I., June 26, 1910, Wm. T. Davis.

New Jersey:

N. J.; Slt. Mdows., N. J.; Elmfield., N. J.; Bloomsburg, N. J., IX-3; Roselle Park, N. J., IV.4.1926, XI.29.1925, and XII-9-1923, A. Nicolay; Cedar Grove, N. J., V.30.1923; Cedar Grove, N. J., IV-5-1925, A. Nicolay; No. Arlington, N. J., III-17, III-26, and XI-7; Arlington, N. J., III-17; Avalon, N. J., 7-5; Orange, N. J., 6/20, Elec. light; Orange, N. J., 6/20, Chittenden Collector; Hopatcong, N. J.; "Upper" Montclair, N. J., VIII.22.1925, A. Nicolay; Camden, N. J., III-3; Cramer Hill, N. J., 5.30.96; Woodbury, N. J. Aug. 7, '96; Westville, N. J., H. W. Wenzel Collector; Mt. Pleasant, N. J., Gerhard Coll.; Hillsdale, N. J., 8.V.26.

Pennsylvania:

Frankford, Pa., VI.21, A. Schmidt Collector; Phila., Pa., 6.22.96; Pennsylvania, Schuppel; Phila. Neck, Pa., VII-21, H. A. and H. W. Wenzel Collectors; Pa.

Delaware:

Del.

District of Columbia:

D. C.; Wash., D. C.; Washgtn., D. C.; D. C., June 11,.86; Washington, D. C., Chittenden Collector; Washington, D. C., III.3.1928, A. Nicolay; Washington, D. C., May, 1922, and May 14, 1921, D. H. Blake Coll.; Washington, D. C., July 1-08, W. L. McAtee Collector; Washington, D. C., 27-IV-13 and July 10, 1913, W. L. McAtee Collector, at light; Wash., D. C., Apr. 22, No. 109. Natrix (*Natrix sipedon,* Bennings Marsh, D. C., April 22, 1917, E. G. Holt).

Virginia:

Va.; Va., Nov. 6.81; Vienna, Va.; Alex. Co., VI-14-10 and IX-2-1910; Alex. Co., Va., June 14, 1910, Wm. T. Davis; Falls Church, Va., 19 Oct.

North Carolina:

N. C.; Raleigh, N. C., April, 03, F. Sherman Collector.

Ohio:

Ohio; Columbus, O., 6-21-14 and 7-30-14, V. R. Haber Collector.

Indiana:

Ind.; Indiana; Millers, Ind., Jul. 13, '07, VII-19-13, and VIII-2-15; Mineral Spg., Ind., IX.2; Lafayette, Ind., IV.3.'16, Satterthwait collector, Under board in swamp; Millers, Ind., VII-9, Liljeblad Collector; Lake Co., Ind., 6-15-03 and 7-28-97, W. S. B.; Kosciusko Co., Ind., 6-9-02, W. S. B.; Steub. Co., Ind., 7-6-04, W. S. B.; Marion Co., Ind., 5-23-97, W. S. B.

Michigan:

Mich.; Detroit, Mich.; Det., Sept.; Detroit, May 21; S. Haven, Mich.; Port Huron, Mich., June; Ottawa Co., Mich., Aug. 26, E. A. P.; Marquette, Mich., 29.7; Leelanau Co., Mich., 7-25-1936, Robert W. Forbes; Harbert, Mich., Bufo am. 1984 (Berrien Co., July 13, 1917, A. G. Ruthven).

Wisconsin:

Wis.; Madison, Dane Co., Wis., V-4-07, C. B. Hardenberg; Beaver Dam, Wis., IV-9-1911, W. E. Snyder; Bayfld., Wis., Wickham; Cranmoor, Wisc., 5-2-8; Cranmoor, Wis., IV.15.10, VI.18.10, and X.14.1909, C. W. Hooker Collector; Cranmoor, Wood Co., Wis., VI.23.07, C. B. Hardenberg; Wis., Bufo 2412 (Stevens Pt., Mellen, Wisconsin, July 19, 1918, A. I. Ortenburger).

Minnesota:

Minn.; Duluth, Minn.; St. Anth. Park, Minn., 7/4, 14/4, 5/20, and 4/7; St. Anthony Pk., Minn., VIII.26.10; St. Anthony Park, Minn., VI-25-1921, W. E. Hoffman, coll. at light; Hennepin Co., Minn., 6/1; Hennepin Co., Minn., May 2, 1936, C. E. Mickel; Hennepin Co., Minn., May 3, 1937, M. T. Jen; Olmstead Co., Minn., C. N. Ainslie; Anoka Co., Minn., May 8 and 9, 1937, M. T. Jen, Kohls, Edward Thomas, K. S. Liu, and H. C. Ma Collectors; Ramsay Co., Minn., May 5; Ramsey Co., Minn., May 15, 1937, K. S. Liu Collector; Ramsay Co., Minn., Battle Creek, April 15, 1922, Wm. E. Hoffmann; Rochester, Minn., 6.23.94, C. N. Ainslie; U. Farm, 14 Apr., '14; St. Paul, Minn., July 5, 1932, Donald Denning; St. Paul, Minn., July 13, 1934, at light, A. A.

Granovsky; St. Paul, Minn., July 26, 1927, Carl T. Schmidt; St. Paul, Minn., University Farm, August 23, 1926, C. T. Schmidt; St. Paul, Minn., University Farm, July 1, 2, and 5, 1937, at light, A. A. Granovsky; St. Paul, Minn., Aug. 24, 1934, A. A. Granovsky, U. Farm; St. Paul, Minn., July 14, 20, 23, and 26, Aug. 5 and 11, and Sept. 15, 1935, U. Farm light trap, A. A. Granovsky; St. Paul, Minn., U. Farm lights, July 23, 1934, Sam Kepperley; St. Paul, Minn., U. Farm lights, July 25, 1921, Wm. E. Hoffman; St. Paul, Minnesota, July 1, 1937, Golf course light trap, A. A. Granovsky; St. Paul, Minnesota, July 11, 1936, U. Golf course light trap, A. A. Granovsky; Albert Lea, Minn., July 10, 1923, at light, P. L. Keene; Frontenac, Minn., May 29, 1930, Wm. C. Stahr; Redwing, Minn., July 15, 1935, A. B. Gurney; Red Wing, Minn., May 16, 1936, O. Elster; Browns Valley, Minn., Aug. 3, 1935, R. H. Daggy; Crookston, Minn., July 9 and Aug. 2, 1935, Light trap, D. G. Denning; Taylors Falls, Minn., Apr. 19, 1935, R. W. Salt; Goodhue Co., Minn., Oct. 10, 1934, Horace O. Lund; Walker, Minn., May 30, 1934, D. Denning; Cass Co., Minn., O. W. Oestlund; 9-mile Creek, Minn., May 2, 1936, A. B. Gurney; Waldo, Minn., Aug., 1906, Witmer Stone.

Illinois:

Ill., N. Ill., Moline, Illinois; Chicago, Ill., Chittenden Collector; Cook Co., Ill., Aug., Blackwelder; Havana, Ill., VIII.14.07; Lake Forest, Ill., U. S. A., 6-VIII-1906, J. G. N.; Waukegan, Ill., Aug. 26, '17; Beach, Ill., lake shore, Aug. 24, '06; Normal, Ill., Apr. 3, 1883; Mt. Pulaski, Ill., June 6, 1885; Urbana, Ill., May 30, 1885; Chicago, Ill., IV:9:05 and VI:1, Col. by W. J. Gerhard.

Iowa:

Ia.; Iowa, Wickham; Iowa City, III-20-98, III-25-98, IV-17-98, and IV-28-98, Wickham; Iowa Cy., Iowa, IV-20-1914, Wickham; Iowa City, Ia., IV.9.1895 and IV.23.1895; Iowa City, Iowa, IV.14 and IV.16, Wickham; Iowa City, Iowa, V-16-'13, Stoner; Iowa City, Ia., Sept. 3-'17, L. L. B.; Sioux City, Ia., 29/4 and 8/7; Ames, Iowa, VIII, 1912, Stoner; Ames, Iowa, July 18, 1916, Collector L. S. Wells; Lake Okoboji, Ia., June 20, 1917, June 23, 1917, June 26, 1917, June 29, 1917, July 10, 1917, and VII-1-'16, L. L. Buchanan; Muscatine, Ia., 4-21-19, F. M. Wadley Collector; Spirit L., Ia., J. H. B.; Guttnbrg., Ia., 18/9/93; Masonville, Ia., F. C. W.; Milford, Ia., VII.14.26, Satterthwait Collector, reared from *Scirpus validus;* Dickinson Co., Iowa, VII, 9-13, 1920; Palo Alto Co., Ia., Bufo 1946 (7-16-07, A. G. Ruthven); Palo Alto Co., Ia., Bufo 1962 (7-5-07, A. G. Ruthven).

Nebraska:

Kenosha, Nebraska.

Kansas:

Kan.; Topeka, Kan., Jul. 17, Popenoe; Riley Co., Ks., Jun. 28, Popenoe; Douglas Co., Kan., 900 ft., L. L. Dyche.

Dakota:

Dak.

North Dakota:

Devil's Lake, N. Dak., June 6-7, Wickham.

Montana:

Poplar, Mont., July 13, 1922, C. C. Sperry Collector, Electric light; Kalispell, Mont., M. P. S.

California:

S. Francisco, Cal.

CANADA

Ontario:

Toronto, Can.; Hamilton, Canada; Port Credit, Ont., XI.9; E. Ont.; Pt. Pelee, Ont., 5.VI.1929, L. J. Milne.

Manitoba:

Aweme, Man., IV.20's, 28.V.08, VII.23, and 12.V.06, Criddle; Aweme, Man., Can., VI.20.10, N. Criddle Collector; Aweme, Manitoba, 1.VI.08, 10.VI.08, 6.VII.1920, and VII.27.11, E. Criddle; Aweme, Man., 13.V.1916, 28.VI.1921, VII.10.1914, and 30.VIII.1917, N. Criddle; Onah, Man., 30.IV. 1928, R. M. White; Stoney Mountain, Man., 8.VI.12, J. B. Wallis.

Saskatchewan:

Redvers, Sask., VII-28-08; Regina, 20.VI.07; Carnduff, N. W. T. Can., VI.16-05; Turnsden, (Sask.?) 28 May 06; Abernethy, N. W. T. Can., VI. 28.05; Saskatoon, Sask., 12.VII.1925, Kenneth M. King.

Bristish Columbia:

Terrace, B. C., Mrs. M. E. Hippisley; Westbank, B. C., IV-23-1925 and VI-7-26, R. Hopping.

Listronotus tuberosus LeConte 1876

(Plate XXXI, fig. 4; Plate XXXVII, fig. 2)

1876. *Listronotus tuberosus* LeConte, Proc. Am. Phil. Soc., Vol. XV, p. 130.
1885. *Listronotus tuberosus* LeConte. Townsend, Can. Ent., Vol. XVII, p. 72.
1890. *Listronotus tuberosus* LeConte. Beutenmüller, Can. Ent., Vol. XXII, p. 200.
1893. *Listronotus tuberosus* LeConte. Beutenmüller, Jr. N. Y. Ent. Soc., Vol. I, p. 40.
1903. *Listronotus tuberosus* LeConte. Ulke, Proc. U. S. N. M., XXV, p. 33.
1910. *Listronotus tuberosus* LeConte. Smith, Insects of New Jersey, p. 382.
1916. *Listronotus tuberosus* LeConte. Blatchley and Leng, Rhynchophora of North Eastern America, p. 154.
1920. *Listronotus tuberosus* LeConte. Britton, Conn. Geol. and Nat. Hist. Surv., Bull. 31, p. 283.
1920. *Listronotus tuberosus* LeConte. Leng, Catalogue of the Coleoptera of America, North of Mexico, p. 316.
1928. *Listronotus tuberosus* LeConte. Leng, Cornell Univ. Agri. Exp. Sta., Memoir 101, p. 495.
1931. *Listronotus tuberosus* LeConte. Schenkling and Marshall, *in* Junk, Coleopterorum Catalogus, Subfam. Cylindrorrhininae, Pars 114, p. 13.
1937. *Listronotus tuberosus* LeConte. Bleasdell, Iowa St. Coll. Jr. Sci., Vol. XI, No. 4, p. 415.

ORIGINAL DESCRIPTION. "Black, densely clothed with yellowish-brown rounded scales, which become larger on the prothorax, and hairlike upon the head. Beak as long as the prothorax, stout, cylindrical, carina and grooves obsolete, frontal fovea feeble. Prothorax as wide as long, sides nearly parallel, suddenly rounded

and narrowed near the tip, indistinctly trivittate with pale and sprinkled with large, distinct black dots. Scutellum pale. Elytra at base broadly emarginate, humeri oblique, so that they become one-third wider than the prothorax, sides gradually narrowed behind the widest part; posterior callus large, conical, prominent; striae punctured, interspaces wide nearly flat; scales uniform in color, very dense, setae very short. Beneath of the same color as above, hind thighs with a pale band. Length, 7 mm.; .28 inch.

"Male. First ventral segment flattened at base, anal segment protuberant beyond the fifth ventral and visible from beneath; elytra rounded at tip.

"Female. Last ventral segment feebly impressed near the tip, each elytron prolonged at tip into a long, straight process.

"Michigan to Georgia. Easily known by the absence of the carina and grooves of the beak, which are so obvious in the two preceding species [*L. obliquus* LeConte and *L. sordidus* (Gyllenhal)]."

Additional Description. *Length,* 5.5 to 9 mm. The scales are often of a bright coppery tinge. There is a narrow median vitta of brighter scales on the prothorax, and there is a wider sinuate vitta of similar scales on each side of the disk. *Beak* about equal in length to the prothorax, rather strongly curved; upper surface usually rounded and with no indication of median carina except at extreme tip; occasional specimens with faint median carina and shallow lateral grooves. Frontal fovea usually quite deep instead of feeble as indicated in the original description. *Prothorax* wider than long. The large, black dots mentioned by LeConte are larger punctures which bear elongate, prominent setae instead of the flattened scales which cover the other punctures of the prothorax. Striae of *elytra* very slightly impressed, punctures rather deep, very narrow and elongate, each bearing a tiny seta; intervals nearly flat, but elytra usually rather rough and uneven due to the presence of low, irregular, transverse wrinkles; each interval with a row of short, rather distant setae. *Male* with tips of elytra conjointly rounded; third and fourth abdominal sterna with a median longitudinal concavity; seventh abdominal sternum with three very slight concavities, one median and longitudinal, the other two lateral, confined to the posterior half of the sclerite. *Female* with tips of elytra prolonged into long cylindrical processes which may be either parallel or convergent; third abdominal sternum feebly concave at middle; seventh abdominal sternum with a median convexity.

NOTES ON TYPES. The type of this species has been examined in the LeConte collection in the Museum of Comparative Zoölogy at Harvard College. The first specimen in the series, and the only one bearing a type label, bears the orange disk, indicating "southern states," and is probably from Georgia. It is a male and is covered with an incrustation of dirt. The second and third specimens in the series are a female and a male, both good, clean specimens, but bearing no other label than one indicating their sex. The fourth specimen is a female of *L. sordidus* (Gyllenhal) and bears only the number 1390.

REMARKS AND COMPARATIVE NOTES. Very closely related to *L. sordidus* (Gyllenhal). For a detailed discussion of the differences see the section of this same heading under that species.

BIOLOGICAL NOTES. The food plant of this species is Sagittaria. It was bred from Sagittaria by Criddle at Treesbank, Manitoba. It was reared from Sagittaria at Woodbury, N. J., by Satterthwait and was determined by him as *L. sordidus* (Gyllenhal) and recorded as such under his Webster Groves No. 26558. A specimen taken at Stoughton, Mass., by Mrs. D. H. Blake bears the following notation: "Found near *Sagittaria latifolia* whose root stocks were heavily infested by some insect." Beutenmüller (1890 and 1893) says that F. M. Chittenden found *L. tuberosus* LeConte, along with *L. caudatus* (Say)and *L. appendiculatus* (Boheman) while sweeping vegetation composed of Sagittaria and Carex. Mr. C. A. Frost has taken the species at Northboro, Mass., by sweeping vegetation along a river. Townsend (1885) records quite a number as having been taken along with *L. callosus* LeConte, *L. frontalis* LeConte, and *L. nebulosus* LeConte under old railroad ties lying on the ground and under pieces of wood in dry places during the early part of April. Blatchley and Leng (1916) say that it has been taken from the margins of ponds and along the beach of Lake Michigan, and that it usually occurs on sandy and muddy ground near water; also that it is often taken by sweeping aquatic plants such as Sagittaria and Carex. The species is sometimes taken at light.

DATA ON DISTRIBUTION. The original description gives the distribution as Michigan to Georgia. Blatchley and Leng (1916) add the territory northward into Quebec. We now know that it occurs as far west as Manitoba and North Dakota, and southward through Iowa, Missouri, and Oklahoma, into Texas. Specimens have been examined from the following localities:

UNITED STATES

Maine:

Monmouth, Me., VII-15-16, C. A. Frost.

New Hampshire:

Plymouth, N. H., VI-29-1926 and VII-20-1930, Darlington.

Massachusetts:

Mass.; Low., Mass.; Chicopee, Mass., June 11.93, June 14.93. May 31.95, and June 9.96; Camb., 4.74; Stoughton, Mass., IX-28-30, Mrs. D. H. Blake; Agawam, Mass; Framingham, Mass., V-2-11, C. A. Frost; Northboro, Mass., IX-7-35, C. A. Frost, Sweeping by river; Holyoke, Mass., D. Dimmock; Lowell, Mass., F. Blanchard; Dorchester, Mass., Apr. 30 and June 30, 1905; Tyngsboro, Ms., 6-16-21; Brookline, Mass.; Tyngs., Mass.; Arlington, Mass., III.6.24.

Connecticut:

Cornwall, Conn., VII-22-1924, C. A. Frost.

New York:

N. Y.; New York City and vicinity; Buffalo, N. Y.; Ithaca, N. Y., 7/9, 8/4, 7/6, and July 6/84, Chittenden Collector; Ithaca, N. Y., June 14, 95 and July 19, 94; Van C. Pk., N. Y., N. Y.; Ithaca, N. Y., July 11, 16, H. Dietrich, Collector.

New Jersey:

N. J.; Arlington, N. J., III.17 and IV-10; No. Arlington, N. J., III-26 and XI-7; Woodbury, N. J., 30.7; Woodbury, N. J., VI.19.26, Sagittaria, Webster Grvs. No. 2655S, Satterthwaite Collector; Milburn, N. J.; Orange, N. J.; Slt. Mdows., N. J.; Riverdale, N. J., 27-V-1923, Quirsfeld.

Pennsylvania:

Frankford, Pa., VI.21, A. Schmidt Collector; Phila. Neck, Pa., VI.24, H. A. Wenzel Collector; Greentown, Pa., 21-VII-1926, Quirsfeld.

District of Columbia:

Washgtn., D. C., IV; Washngtn., D. C., My.III, Coll. Chittenden; Washington, D. C., VI-22.'23, J. R. Greeley Coll., at light.

Virginia:

Glencarlyn, Va., 11-VI-14, F. Knab.

Indiana:

Laporte Co., Ind., 6-9-'02, W. S. B.

Illinois:

Chicago, Ill.; Urbana, Ill., VII:19:07, at light, Hart S. Hood; Rock Island, Ill., June 24, 1931, Coll. Mohr; Normal, Ill., 7-14-82; Springfield, Ill., June 24, 1885, Coll. Hart, Electric Lights.

Michigan:

Mich.; Marquette, Mich.; Port Huron, Mich., June; S. Haven, Mich., 6-1-91; Saginaw Co., Mich., VII, 17, 1910, A. W. Andrews; Floodwood, Mich., July 18, 1915, A. W. Andrews; Alger Co., Mich., Aug. 2, 1916, A. W. Andrews; Cheboygan Co., Mich., Douglas Lake, VII.23.1917, M. H. Hatch; Washtenaw Co., Mich., VI-17-1921, M. H. Hatch; Cheboygan, Mich., Bufo 2075 (Douglas Lake, June 26, 1915, W. A. Wood).

Wisconsin:

Wis.; Cranmoor, Wis., III.18.10, C. W. Hooker Collector.

Minnesota:

Plummer, Minn., June 6, 1933, D. Denning; St. Anth. Park, Minn., 5.9.90; Olmsted Co., Minn., C. N. Ainslie; Crookston, Minn., July 9, 1935, Light Trap, D. G. Denning.

Iowa:

Sioux City, Ia., 29/4; Ames, Iowa, VI-'13, D. Stoner.

North Dakota:

Larimore, N. D., Bufo 1810 (June 22-30, 1915, R. Kellogg); Rugby, N. D., 1918, C. N. Ainslie Collector.

Missouri:

Ferguson, Mo., IV.18.23, H. E. Roberts Collector.

Oklahoma:

Page, Okla., June 23, 1937, Standish-Kaiser.

Texas:

Tex.

CANADA

Quebec:

Kazubazua, Que., 18-VIII-'31, W. J. Brown; Berthierville, P. Q., V-30-21 and VI-10-21.

Ontario:

Toronto, Ont.; Toronto, Can., VII-10, R. J. Crew.

Manitoba:

Treesbank, Man., 16.IX.1925, N. Criddle, Bred from Sagittaria; Aweme, Man., 13.VIII.1922, E. Criddle.

Listronotus sordidus (Gyllenhal) 1834

(Plate XXXIII, fig. 5; Plate XXXVI, fig. 9)

1834. *Listroderes sordidus* Gyllenhal, *in* Schönherr, Genera et Species Curculionidum, II, 1, p. 280.

1834. *Listroderes distinguendus* Gyllenhal, *in* Schönherr, Genera et Species Curculionidum, II, 1, p. 281.

1842. *Listroderes sordidus* Dejean. Boheman, *in* Schönherr, Genera et Species Curculionidum, VI, 2, p. 192.

1842. *Listroderes distinguendus* Dejean. Boheman, *in* Schönherr, Genera et Species Curculionidum, VI, 2, p. 192.

1853. *Listroderes sordidus* Schönherr. Melsheimer, Catalogue of the described Coleoptera of the United States, p. 95.

1853. *Listroderes distinguendus* Schönherr. Melsheimer, Catalogue of the described Coleoptera of the United States, p. 95.

1871. *Listroderes sordidus* Gyllenhal. Gemminger and Harold, Catalogus Coleopterorum, VIII, p. 2360.

1871. *Listroderes distinguendus* Gyllenhal. Gemminger and Harold, Catalogus Coleopterorum, VIII, p. 2360.

1873. *Listroderes sordidus* Gyllenhal. Crotch, Check List of the Coleoptera of America, North of Mexico, p. 118.

1873. *Listroderes distinguendus* Gyllenhal. Crotch, Check list of the Coleoptera of America, North of Mexico, p. 118.

1876. *Listronotus sordidus* (Gyllenhal). LeConte, Proc. Am. Phil. Soc., XV, p. 129.

1876. *Listronotus distinguendus* (Gyllenhal). LeConte, Proc. Am. Phil. Soc., XV, p. 129. (Discussed as synonym of *L. sordidus* Gyllenhal.)

1876. *Listronotus obliquus* LeConte, Proc. Am. Phil. Soc., XV, p. 129.

1889. *Listronotus sordidus* (Gyllenhal). Kilman, Can. Ent., XXI, p. 136.

1903. *Listronotus sordidus* (Gyllenhal). Knaus, Trans. Kan. Acad. Sci., XVIII, p. 189.

1910. *Listronotus sordidus* (Gyllenhal). Smith, Insects of New Jersey, p. 382.

1911. *Listronotus obliquus* LeConte. Mitchell and Pierce, Proc. Ent. Soc. Wash., XIII, p. 50.

1916. *Listronotus sordidus* (Gyllenhal). Blatchley and Leng, Rhynchophora of North Eastern America, p. 155.

1920. *Listronotus sordidus* (Gyllenhal). Leng, Catalogue of the Coleoptera of America, North of Mexico, p. 316.

1920. *Listronotus distinguendus* (Gyllenhal). Leng, Catalogue of the Coleoptera of America, North of Mexico, p. 316. (Listed as a possible synonym of *L. sordidus.*)

1920. *Listronotus obliquus* LeConte. Leng, Catalogue of the Coleoptera of America, North of Mexico, p. 316.

1928. *Listronotus sordidus* (Gyllenhal). Leng, A List of the Insects of New York, Cornell Univ. Agric. Exp. Sta., Memoir 101, p. 495.

1928. *Listronotus obliquus* LeConte. Leng, A List of the Insects of New York, Cornell Univ. Agric. Exp. Sta., Memoir 101, p. 495.

1928. *Listronotus inaequalipennis* Blatchley, *nec* Boheman. Blatchley, Jr. N. Y. Ent. Soc., XXXVI, p. 241.

1931. *Listronotus sordidus* (Gyllenhal). Schenkling and Marshall, *in* Junk, Coleopterorum Catalogus, Subfam. Cylindrorrhininae, Pars 114, p. 12.

1931. *Listronotus distinguendus* Gyllenhal. Schenkling and Marshall, *in* Junk, Coleopterorum Catalogus, Subfam. Cylindrorrhininae, Pars 114, p. 12. (Listed as synonym of *L. sordidus* Gyllenhall.)

1931. *Listronotus obliquus* LeConte. Schenkling and Marshall, *in* Junk, Colepterorum Catalogus, Subfam. Cylindrorrhininae, Pars 114, p. 12.

1937. *Listronotus sordidus* (Gyllenhal). Bleasdell, Ia. St. Coll. Jr. Sci., Vol. XI, No. 4, p. 415.

ORIGINAL DESCRIPTION. "Niger, opacus, dense cinereo-squamosus et fusco-sub-setosus, antennis tarsisque piceis, rostro crassiusculo, carinato, elytris subremote punctato-striatis, punctis aequalibus, interstitiis convexis.

"*Hypera sordida.* Dom. Com. Dejean in Litteris.

"Habitat in America boreali. Dom. Com. Dejean. Mus. Schh.

"Statura *Erith. bimaculati,* sed duplo minor. Caput convexum, confertim punctatum, nigrum, squamulis minutis cinereis adspersum; oculi laterales, oblongi, brunnei, parum prominuli; rostrum longitudine fere capitis cum thorace, validum, parum arcuatum, confertim punctatum, in medio carinatum, nigrum, cinereo-squamulosum. Antennae longiusculae, ferrugineo-piceae, pilosae, clava acuminata. Thorax latitudine brevior, antice late et profunde emarginatus, lobis ocularibus productis, rotundatis; longe intra apicem constrictus, lateribus rotundato-ampliatus, basc bi-sinuatus, supra convexus, pulvinatus, confertim punctatus; niger, squamis majusculis, rotundatis, depressis, cinereo-albidis tectus, setisque minutis concoloribus adspersus. Scutellum rotundatum, nigrum, squamosum. Elytra antice sub-truncata, thoracis basi multo latiora, pone basin oblique ampliata, humeris elevatis; dein posterius attenuata, apice conjunctim rotundata, thorace quadruplo longiora, supra convexa, sat profunde striata, striis remote punctatis, punctis aequalibus; interstitiis convexis; nigra, squamulis denis cinereis tecta setulisque fuscus adspersa, praesertim posterius; squamulis detritis interstitia

laevia, nitida; intra apicem singuli elytri callus elevatus observatur. Pygidium obtusum, dense cinereo-squamosum. Corpus subtus nigrum, magis nitidum, profunde punctatum, cinereo-squamosum. Pedes longiusculi, valida, nigri, femoribus clavatis, punctatis, cinereo-squamosis, tibiis arcuatis, scabris, tarsis dilatatis piceis, subtus albido-spongiosis. —Ghl."

ADDITIONAL DESCRIPTION. *Length*, 6.5 to 10.5 mm. Elongate-oblong. Body black, elytra often partly or entirely piceous. Rather thickly clothed with scales which vary a great deal in color, ranging from light brown to dark brown, sometimes cupreous. Prothorax with narrow median and wider lateral vittae of paler scales. Humerus often with small spot of light scales continued from prothoracic vitta. There is an oblique dark mark centering on the fourth elytral interval at the anterior third, sometimes present only on that interval, other times longer and extending in some cases to include the second and sixth intervals. When this dark line is fully developed it extends posteriorly and toward the suture, reaching a little past the middle of the elytron; it extends anteriorly toward the humerus. The oblique line is often more strongly developed on the lighter specimens, and on some very dark individuals may not be at all evident. There is a tendency for the scales between the oblique lines to be of a slightly darker color. *Beak* moderately stout, slightly longer than the prothorax. Upper surface with a distinct sharp median carina, lateral carinae usually moderately developed, not sharp. *Antennae* slender, second segment of funicle twice as long as first, third distinctly longer than fourth. *Head* slightly convex, densely, moderately punctate, the punctures bearing short, slender scales; frontal fovea usually deep and elongate. *Prothorax* wider than long, ocular lobes moderately developed; sides nearly parallel for three-fourths their length, then strongly rounded to apex; base slightly arcuate; disk quite densely punctate with moderately large, but very shallow punctures. *Scutellum* elongate, covered with slender scales. *Elytra* emarginate at base; humeri oblique; slides slightly narrowed to apical fourth, then strongly rounded to apex; striae fine, slightly impressed, the punctures very small, elongate, each bearing a tiny seta; intervals sometimes almost flat, usually slightly convex, especially the odd ones; intervals each with a row of distant punctures bearing setae which are more evident on the declivity; third and fifth intervals with punctures confused instead of in a single row; posterior calli prominent. *Ventral surface* with sides of all the sterna, except seventh abdominal, rather thickly clothed

with large, round scales; middle of third and fourth abdominal sterna clothed with round scales; middle of fifth and sixth abdominal sterna and all of the seventh clothed only with elongate scales or setae. *Male* with tips of elytra conjointly rounded or very slightly subacuminate; third abdominal sternum concave at middle. *Female* with tip of each elytron prolonged into a short conical process; third abdominal sternum convex; seventh abdominal sternum with a slight depression in each posterior corner and with a short, rather deep median groove at the posterior part of the sclerite.

NOTES ON SYNONYMY. LeConte (1876) discusses *L. distinguendus* (Gyllenhal) as a synonym of *L. sordidus* (Gyllenhal), stating that it "seems to differ from the type only by smaller size and slightly irregular elytral puncturing; similar variations occur in other species."

L. obliquus LeConte has also been found to be a synonym of *L. sordidus* (Gyllenhal). In his description of the species LeConte gives no distinguishing features by which it may be separated from *L. sordidus* (Gyllenhal). Specimens from Texas, Louisiana, Alabama, and Florida have been found which agree with the types of *L. obliquus* LeConte which are from Texas. Occasional larger specimens from the northern states also compare with the types of *L. obliquus* LeConte. These specimens are somewhat larger than most of the northern individuals. The larger northern specimens and most of those from the south usually tend to be a little lighter in color. They may have the beak a little more distinctly carinate and sulcate and the frontal fovea a little deeper and more elongate. There is also a tendency for the alternate intervals of the elytra to be more strongly convex in the larger southern specimens. None of these characters is constant, however, and a careful examination of rather long series has indicated that the northern and southern specimens belong to the same species. Individuals can be picked out which are very different in size and seem to differ considerably even in regard to morphological characters. By studying additional material the variation within the species soon fills in a multitude of intermediate forms between the two extremes which had been segregated. *L. distinguendus* (Gyllenhal) and *L. obliquus* LeConte, the two synonyms of *L. sordidus* (Gyllenhal), have been erected on individuals representing the extremes of variation found within the species.

NOTES ON TYPES. *L. sordidus* (Gyllenhal) and *L. distinguendus* (Gyllenhal) are the only names proposed in this genus for which

type material of some sort has not been studied, with the exception of the two species described by Say, the types of which have been lost or destroyed. Horn and Kahle (1935) state that the Gyllenhal Collection is deposited in the museum at Uppsala, Sweden. The types of *L. obliquus* LeConte are in the LeConte Collection in the Museum of Comparative Zoölogy at Harvard College. There are two specimens, both females, which bear the locality label, "Tex."

REMARKS AND COMPARATIVE NOTES. *L. sordidus* (Gyllenhal) is very closely related to *L. tuberosus* LeConte and sometimes, especially in the case of males, the two species are very difficult to separate on external characters. The males can be readily separated by the different shape of the apex of the median lobe of the genitalia, and the females can be separated by the shape of the eighth abdominal sternum. The females of *L. sordidus* (Gyllenhal) may be distinguished by the shorter and usually stouter appendages of the elytra and by the less convex seventh abdominal sternum. The beak of *L. sordidus* (Gyllenhal) is usually more strongly carinate and sulcate, while in *L. tuberosus* LeConte the beak is usually smooth, with the median carina faint or absent, and the lateral grooves obsolete. In *L. sordidus* (Gyllenhal) the elytra are smooth, or have the alternate intervals more convex. In *L. tuberosus* LeConte the intervals are of about equal convexity, but the elytra are roughened by transverse wrinkles. The anterior margin of the elytra of *L. tuberosus* LeConte is somewhat reflexed, while in *L. sordidus* (Gyllenhal) it is more rounded.

BIOLOGICAL NOTES. Nothing is known of the life history or food plant of this species. It is reported to have been taken in a cotton field at Cameron, La., on September 10, 1904, by Wm. Laurents. Since no other records are known of its occurrence on cotton it probably has no connection with this plant, but was merely a chance visitor in the field when it was captured. A specimen was taken on Sagittaria by H. P. Löding, at Mobile, Ala., on June 29, 1920. It has been taken at light in Louisiana. It was found in the stomach of *Bufo valliceps* at New Orleans, La.

DATA ON DISTRIBUTION. *L. sordidus* (Gyllenhal) and *L. distinguendus* (Gyllenhal) were both described from boreal America. LeConte (1876) gives the range as Massachusetts to Georgia. Blatchley and Leng (1916) list "Ontario and New England to Lake Superior, south to Georgia and Texas." Quebec is added to the Canadian localities. In the United States it has been found to extend south into Florida and as far west as Colorado. The records of distribution of the specimens examined are as follows:

UNITED STATES

Massachusetts:

Mass.; Chicopee, Mass.; Chicopee, M., June 20, '95; Chicopee, M., Apr.12. 95.; Dorchester, Mass., July 12-15, '09; Tyngsboro, Ms., 1.21.08; Tyngs., 4/17-87; Wayland, Mass., 7-VI-1931, Quirsfeld.

Connecticut:

New Haven, Ct., 9 July, 1912, At Light.

New York:

N.Y.

New Jersey:

N. J.; Slt. Mdows., N. J., III.20 and IV.9; Arlington, N. J.; No. Arlington, N. J., III-26; Milburn, N. J.; Blmfield., N. J.

Pennsylvania:

Frankford, Pa., VI.21, A. Schmidt Collector.

North Carolina:

N. C.

Florida:

Kissimmee Fla.; Tamiami Trail, Fla.; Sanford, Fla., 6.8.'29; Homestead Fla., June, 1929, Darlington.

Alabama:

Mobile Co., Ala., H. P. Loding; Mobile, Ala., VI-29-20, H. P. Loding, Sagittaria; Mobile, Ala., VI.11.27, Darlington; Mobile, Ala., VII-1-21, H. P. Loding; Magazine Pt., Ala., VIII.16-25, H. P. Loding; Whistler, Ala., H. P. Loding.

Louisiana:

La.; Gueydan, La., May 24, May 28, May 29, May 30, June 4, June 13, June 15, June 16, June 20, June 25, June 26, June 28, July 5, July 11, July 21, July 28, Aug. 3, Aug. 5, Aug. 7, Aug. 16, and Sept. 14, 1925, E. Kalmbach, at light; Gueydan, La., VI, 15-16, '25, E. Kalmbach, At Light; Lafayette, La., Sept., '04; New Orleans, La., 26.91 and 6.7.95; N. Orleans, La., 26/3; Abbeville, La., 16.V.25, J. O. LeBlanc; Cameron, La., Set. 10, 1904, Wm. Laurents.

Kentucky:

Kentucky, Sanborn.

Indiana:

Ind.; Laporte Co., Ind., 9-15-93 and 6-19-'01, W. S. B.; Porter Co., Ind., 6-19-02, W. S. B.; Millers, Ind., VII.19.13.

Illinois:

N. Ill.; Chicago, Ill., 3/9; Cook Co., Ill., Aug., Blackwelder; Cook Co., Ill., Col. & pres. by E. B. Chope.

Michigan:

Mich.; Marquette Co., Mich., July 13, 1920, A. W. Andrews; Washtenaw Co., Mich., VI-17-1921, M. H. Hatch.

Wisconsin:

Wis.

Minnesota:

Minn.; St. Paul, Minn., Elks Golf Ponds, June 20, 1921, W. E. Hoffman; Chicago Co., Minn., O. W. Oestlund.

Iowa:

Ia.; Iowa; Iowa City, IV.29.00, Wickham; Iowa City, Iowa, IV.16; Sioux City, Ia., 20/4.

Missouri:

St. L., Mo.

Arkansas:

Hope, Ark., 6-23-23.

Texas:

Tex.; College Station, Tex., June 30, 1931, and Aug. 8, 1931, H. J. Reinhard.

Colorado:

Col.

CANADA

Quebec:

Berthier, P. Q., VI-9-21.

Listronotus manifestus new species

(Plate XXXV, fig. 4; Plate XXXVI, fig. 8)

Length, 7 to 9 mm. Elongate-oblong. Body black. Densely covered with imbricated scales which are dark brown, light brown, and fulvous, sometimes with a cupreous or brassy tinge. Color pattern usually not definitely marked, but may be sharply defined in some individuals. In these cases the first three and last three intervals of the elytra and most of the prothorax are covered with dark-brown scales. On the disk of the prothorax there is a narrow median vitta and wider, irregular, lateral vittae of fulvous scales. On the elytra there is a longitudinal band of these light scales on the fourth to the eighth intervals and extending posteriorly to the tips of the elytra, crossing the last three intervals there. This light band is interrupted by the dark-brown scales for a short distance on the fourth interval just a little in front of the middle and on the seventh and eighth intervals just behind the middle. *Beak* slightly longer than prothorax, rather stout, strongly curved; median carina fine and sharp, sides of beak rounded, smooth, lateral grooves and sulci not at all indicated; upper surface densely and finely punctate, thickly covered with small, rounded scales. *Head* flattened between the eyes, very densely and finely punctate; upper part with narrow scales; rounded scales between the eyes, becoming larger on the frontal fovea, which is deep. *Antennae* moderately slender; second segment of funicle one-half longer than first, third segment elongate, longer than fourth. *Prothorax* one-fifth to one-fourth wider than long; ocular lobes much larger than in any of the other species of this group, enlarged and produced ventrally to form a ridge in front of each anterior coxa and causing the prosternum to have the appear-

ance of being deeply emarginate in front; prosternum sulcate at middle; sides of prothorax nearly straight, converging from base to apex; disk finely, densely, deeply, and cribrately punctate, thickly clothed with imbricated scales which are slightly larger than those of the elytra; only a very few open punctures on the disk bearing short inconspicuous setae. *Scutellum* elongate, thickly covered with tiny light-colored scales. *Elytra* elongate; moderately and angularly emarginate at base; humeri oblique; an angulate prominence just behind the humeri; sides gradually narrowed to apical fourth then strongly converging to the conjointly rounded apices; striae slightly impressed, finely punctate; intervals slightly convex; setae very small, not at all prominent; posterior calli obsolete. *Ventral surface* finely and densely punctate; everywhere thickly clothed with rounded scales except seventh (fifth visible) abdominal sternum where the punctures bear setae instead of scales. *Legs* moderately stout, squamose and setose; femora with a preapical band of light scales; tibiae with apical mucrones short and stout; front and middle tibiae with a row of minute acute teeth along their inner margins. *Male* with third (first visible) abdominal sternum broadly and deeply concave at middle; seventh (fifth visible) abdominal sternum slightly convex. *Female* with basal part of third (first visible) abdominal sternum convex, median posterior part slightly concave; seventh (fifth visible) sternum unmodified; seventh tergum deeply emarginate at apex.

NOTES ON TYPES. Holotype male, "Gregory, Tex., June 8, '04, at light." Allotype female, "Victoria, Tex., 7-16-16, J. D. Mitchell collector, at light." Six paratypes as follows: 1 male, "Victoria, Tex., 8-5-16, J. D. Mitchell collector, at light"; 1 male, "Victoria, Tex., 7-25-16, J. D. Mitchell collector, at light, Hunter No. 3749"; 1 male, "Kingsville, Texas, C. T. Reed"; 1 male, "Hidalgo Co., Tex., 5-19-1930, J. C. Gaines collector, Tex. Exp. Sta. Light Trap"; 1 male, 1 female, "Brownsv'le., Tex., VI, 11-16, '33, Darlington."

Holotype and allotype in the United States National Museum. Paratypes in the United States National Museum, the Museum of Comparative Zoölogy at Harvard College, and the Francis Huntington Snow Entomological Collections at the University of Kansas.

REMARKS AND COMPARATIVE NOTES. This species is rather distinct, but is probably most closely related to *L. sordidus* (Gyllenhal). It may be readily distinguished by the very large ocular lobes, the anteriorly converging sides of the prothorax, and the light band on the sides of the disk of the elytra. It may be separated from *L.*

sordidus (Gyllenhal) by the smoother sculpturing of the beak, by the obsolete posterior calli of the elytra, and the absence of the elevated alternate intervals.

BIOLOGICAL NOTES. Taken at light.

DATA ON DISTRIBUTION. Known only from Texas.

Listronotus rotundicollis LeConte 1876

(Plate XXXIV, fig. 3; Plate XXXVII, fig. 5)

1876. *Listronotus rotundicollis* LeConte, Proc. Am. Phil. Soc., Vol. XV, p. 132.
1876. *Listronotus cribricollis* LeConte, Proc. Am. Phil. Soc., Vol. XV, p. 134.
1907. *Listronotus setosus* Pierce, *nec* LeConte. Pierce, Neb. St. Bd. Agri., Rept. Zoölogy, p. 259.
1911. *Listronotus rotundicollis* LeConte. Mitchell and Pierce, Proc. Ent. Soc. Wash., Vol. XIII, p. 50.
1916. *Listronotus rotundicollis* LeConte. Blatchley and Leng, Rhynchophora of North Eastern America, p. 157.
1916. *Listronotus cribricollis* LeConte. Blatchley and Leng, Rhynchophora of North Eastern America, p. 163.
1920. *Listronotus rotundicollis* LeConte. Leng, Catalogue of the Coleoptera of America, North of Mexico, p. 316.
1920. *Listronotus cribricollis* LeConte. Leng, Catalogue of the Coleoptera of America, North of Mexico, p. 317.
1931. *Listronotus cribricollis* LeConte. Schenkling and Marshall, *in* Junk, Coleopterorum Catalogus, Subfam. Cylindrorrhininae, Pars 114, p. 11.
1935. *Listronotus* (*?rotundicollis* LeConte). Jones, Proc. Ent. Soc. Wash., Vol. XXXVII, p. 151.

ORIGINAL DESCRIPTION. "Blackish, covered with the usual scales, of a dirty-brown; beak feebly carinate, lateral grooves almost obsolete; frontal fovea distinct. Prothorax as wide as long, sides strongly rounded, clothed with paler scales; surface coarsely and densely punctured; an indistinct paler dorsal stripe may also be traced. Elytra with deep punctured striae, and convex interspaces; posterior callus obsolete. Length, 7.5 mm.; .30 inch.

"Female. Last ventral with a large shallow rounded impression; elytra conjointly rounded at tip. Male wanting.

"One female, Georgia. Quite distinct by the more rounded prothorax. The funiculus of the antennae is as slender as in any of the preceding species; the setae of the elytra are rather more conspicuous."

ADDITIONAL DESCRIPTION. *Length,* 5.5 to 8 mm. Beak slender, slightly curved, about same length as prothorax; covered with rounded scales until a short distance behind insertion of antennae, shining and with only a few short slender setae from that point to apex; median carina fine, but distinct, partly covered by scales so that it does not appear to be quite as prominent in fresh specimens as in those with part or all of the scales rubbed off; coarsely and rugosely punctate, the punctures covered by the scales so that fresh

specimens appear smooth; lateral sulci faint, also obliterated by scaly covering. *Head* convex, lower part very densely covered with scales, upper part clothed with setae; frontal fovea deep. *Antennae* slender, second segment of funicle not quite twice as long as first, third segment elongate, longer than fourth, and nearly as long as first. *Prothorax* one-fifth wider than long; ocular lobes prominent; sides strongly rounded; disk convex, densely and coarsely punctate; scales on disk noticeably larger than those of elytra and distinctly striated, not imbricated; a narrow median and indistinct oblique lateral vitta of paler scales; a number of rather long, slender, semierect setae arising from larger open punctures. *Elytra* elongate-oblong, about three times as long as prothorax; base rather deeply emarginate, humeri oblique; sides nearly parallel for two-thirds of their length, then narrowed to the conjointly rounded apices; striae deeply impressed, their punctures small and closely placed; intervals convex, thickly clothed with imbricated scales, each interval with a single row of rather long, semierect, light-colored setae, which become longer on the declivity. *Male* with third and fourth abdominal sterna sparsely and moderately coarsely punctate, slightly impressed at middle; seventh sternum sparsely and finely punctate, sometimes with a very broad and feeble transverse impression toward the apex. *Female* with third and fourth abdominal sterna moderately and sparsely punctate, slightly convex at middle; seventh abdominal sternum with a large, deep median impression, sometimes rounded, sometimes slightly transverse, usually shining and sparsely punctate; seventh tergum truncate at apex.

NOTES ON SYNONYMY. *L. cribricollis* LeConte has been found to be a synonym of *L. rotundicollis* LeConte. According to the original descriptions about the only difference that can be expected in the two is that of size. The structure of the seventh abdominal sternum of the female is described in about the same way. An examination of the types proves that these two species are the same. I do not know why LeConte placed *L. cribricollis* LeConte among those species having the third segment of the funicle globose and equal to the fourth. It is in reality elongate and longer than the fourth segment.

NOTES ON TYPES. The types of both *L. rotundicollis* LeConte and *L. cribricollis* LeConte have been examined in the Museum of Comparative Zoölogy at Harvard College. Both types are females, and bear the orange disk indicating the "southern states." LeConte gives Georgia as the place of collection of both of these specimens. The

type of *L. rotundicollis* LeConte has the disk of the prothorax somewhat rubbed. Beside the type in the LeConte Collection there is a female of *L. frontalis* LeConte, without any label. Beside the type of *L. cribricollis* LeConte there are two additional specimens, the first a male *L. frontalis* LeConte from "Alamosa, Colorado," and the second a specimen of *L. oregonensis* (LeConte).

BIOLOGICAL NOTES. Pierce (1907) records a species of Listronotus on cotton at Victoria, Tex., the species having been determined by him as *L. setosus* LeConte. A specimen upon which this record was based, determined by Pierce as *setosus,* has been examined, and in reality is *L. rotundicollis* LeConte. Mitchell and Pierce (1911) record the species as having been taken on cotton at Victoria, Tex. Some of the specimens on which this record is based have been examined. It was taken at Goliad, Tex., by C. R. Jones, on cotton. *L. rotundicollis* LeConte was taken on spider lily by Mitchell in Victoria, Tex., on March 20. The species is often taken at light. Jones (1935) records a species which was questionably determined as *L. rotundicollis* LeConte as having been taken in beach drift in Virginia after a storm. One of the specimens taken, bearing the information, "Va. Beach, Va., 10/18/32, Walker, Jones, & Brannon," has been examined and definitely belongs to this species.

DATA ON DISTRIBUTION. This species has been recorded previously from Virginia, Georgia, and Louisiana. We now know that the range extends as far north as Pennsylvania and southwest through Kentucky, Arkansas, Oklahoma, and Texas. Specimens examined have been as follows:

Pennsylvania:

Phila. Neck, Pa., VI-24, H. A. Wenzel Collector.

Virginia:

Va.; Va. Beach, Va., 10/18/32, Walker, Jones, & Brannon.

Georgia:

Georgia.

Florida:

Archer, Fla., 3.82.

Louisiana:

Gueydan, La., May 28, May 29, May 30, June 11, June 14, June 15, June 20, June 28, July 1, July 11, July 21, July 28, Aug. 3, Aug. 5, Aug. 7, and Aug. 16, 1925, E. Kalmbach, at light; Gueydan, La., Apr. 29, '26, E. Kalmbach, at light; Covington, La., 28/5.

Kentucky:

Kentucky, Sanborn.

Arkansas:

Hope, Arkansas, June 6, 1932, C. E. White collector.

Oklahoma:

Okmulgee, I. T., Je.24, J. D. Mitchell Collector, at light; Oswalt, Okla., July 3, 1937, Standish-Kaiser.

Texas:

Dallas, Tx., 11 Je.06, A. J. Leister Collector; Gregory, Tex., June 8, '04, at light; Victoria, Tex., 5.23.04, C. M. Walker Collector, on cotton; Victoria, Tx., J. D. Mitchell Collector; Victoria, Tex., 23.3, E. A. Schwarz Collector; Victoria, Tex., 9.9.04, F. H. Chittenden Coll., Victoria, Tex., 3-20-17, J. D. Mitchell Collector, On spider lily; Victoria, Tex., 7-16-16 and IX-9-15, J. D. Mitchell Collector, at light; Victoria, Tex., 16-12-10, J. D. Mitchell Collector, in woods; Taft, Tex., 5/13 10; Goliad, Tx., 11 Aug. 06, C. R. Jones Collector, on cotton; Corpus Chr., Tx., V.31.07, Spooner; Kingsville, Texas, C. T. Reed; Lelita, Tex., 7.6.16, J. D. Mitchell Collector, at light; College Station, Tex., April 30, 1930, May 9, 1930, May 20, 1930, S. E. Jones Collector, Tex. Exp. Sta. Light Trap; College Station, Tex., May 7, 1930, May 19, 1933, May 20, 1930, June 5, 1931, H. J. Reinhard Collector, Tex. Exp. Sta. Light Trap; El Campo, Tex., 6-8-1923.

Listronotus distinctus new species

(Plate XXXIV, fig. 2; Plate XXXVI, fig. 2)

Length, 7.5 to 10 mm. Oblong, robust. Body mostly black, antennae and tarsi piceous. Rather thickly clothed with large scales which are dark brown, light brown, or cinereous, indiscriminately arranged on the elytra to form irregular mottlings; scales of disk of prothorax larger than those on elytra, not imbricated, cinereous scales forming a very narrow median vitta and a broader irregular vitta on each side of the disk; head and beak thickly clothed with slender scales. *Beak* moderately stout, slightly curved, a little more so in the female than in the male; about the same length as the prothorax; tricarinate, the median carina distinct, sharp, smooth, the lateral carinae not as sharp and usually not quite as prominent, punctate; lateral sulci rather deep on the basal half of the beak; surface rough, densely, rugosely punctate. *Antennae* rather slender; second segment of funicle nearly twice as long as first; third segment elongate, longer than fourth, not quite as long as first. *Head* slightly convex, densely and coarsely punctate; frontal fovea rounded, distinct. *Prothorax* about one-fifth wider than long in male, slightly more in female; ocular lobes well developed; sides strongly rounded, widest at middle; disk convex, very densely, deeply, and moderately coarsely punctate; a great many scattered larger punctures bearing elongate semierect setae. *Scutellum* slightly elongate, thickly covered with short, fine, yellowish setae. *Elytra* deeply rounded at base; anterior margin slightly reflexed along first five intervals; humeri oblique; sides rounded

behind the humeri, then parallel for two-thirds the length, then narrowed to the conjointly rounded tips; striae fine, impressed, the punctures distinct, closely placed; intervals convex, each with a row of slender semierect setae which become longer and more erect on the declivity; elytra without transverse wrinkles; posterior calli very feeble; first intervals raised and more prominent in the region between the posterior calli, at the beginning of the declivity. *Legs* moderately stout; apical half of femora with a covering of rounded scales and slender setae, basal half with only short slender setae; tibiae with a very few scattered small scales and many long, whitish bristles; apical mucrones rather long. *Male* with third and fourth (first and second visible) abdominal sterna impressed at middle; all the abdominal sterna rather sparsely punctate, the punctures not all the same size, with very long, slender setae arising from the larger punctures; a few rounded scales along the sides of the abdominal sterna, more numerous on the third and fourth; seventh (last visible) sternum convex along the median half for its entire length. *Female* with third and fourth (first and second visible) abdominal sterna convex at middle; punctation and covering of abdominal sterna much the same as in the male except that the setae are not as long or as numerous and that there are more rounded scales present, often extending entirely across the fourth (second visible) abdominal sternum; seventh (last visible) sternum with a large semicircular area across the middle of the basal half, which is smooth and shining; a feeble impression across the entire width of the seventh (last visible) sternum just before the apex which is slightly raised and has a semicircular apical emargination at the middle; seventh tergum broadly and shallowly emarginate at apex.

NOTES ON TYPES. Holotype male, "Dimmit Co., Texas, Col. Hubbard & Schwarz." Allotype female, "Waco, Tex., V.22." Fourteen paratypes as follows: 1 male, 1 female, "Waco, Tex., V.22"; 1 male, "Kingsville, Texas, C. T. Reed"; 2 males, "Brownsv'le, Tex., VI, 11-16, '33, Darlington"; 1 male, "Brownsville, Tex., VI-25-08"; 1 male, 2 females, "Victoria, Tex., 7-31-16, 8-5-16, and 8-7-16, J. D. Mitchell collector, at light"; 2 males, "Madison Co., Tex., VI-20-31 and VI-21-31, Bibby & Tate collectors"; 1 female, "Amarillo, Tex., 8/02"; 1 female, "El Campo, Tex., 6-8, 1923"; 1 female, "Altair, Colo. Co., I.10.11, C. T. Atkinson."

Holotype and allotype deposited in the United States National Museum. Paratypes in the United States National Museum, Museum of Comparative Zoölogy at Harvard College, Francis Hunting-

ton Snow Entomological Collections at the University of Kansas, and in the collections of the Illinois Natural History Survey at Urbana, Ill., H. C. Fall at Tyngsboro, Mass., and at College Station, Texas.

REMARKS AND COMPARATIVE NOTES. Related to *L. scapularis* Casey, but may be separated from it by the following characteristics: beak a little stouter, lateral carinae more prominent; disk of prothorax with more large punctures, and with setae longer and more prominent; base of elytra more deeply emarginate and humeri more oblique; elytra rounded behind the humeri and without the angulate prominences of *L. scapularis* Casey; elytral intervals more convex, first intervals more prominent at declivity of elytra, and posterior calli less prominent; seventh (last visible) abdominal sternum of male convex and that of female without the deep depression of *L. scapularis* Casey, and with the apical emargination narrower and deeper; tips of female elytra conjointly rounded instead of separately acuminate. The males may easily be separated by the shape of the median lobe and females by the shape of the eighth sternum.

Also resembles *L. rotundicollis* LeConte to some extent, but differs in the following respects: thicker and more strongly carinate beak; prothorax less constricted anteriorly and with coarser punctation on the disk; elytra more strongly emarginate at base; humeri more oblique. The seventh and eighth sterna of the females are different and the genitalia of the males are very different.

BIOLOGICAL NOTES. This species has been taken at light.

DATA ON DISTRIBUTION. Known only from the southern half of Texas.

Listronotus scapularis Casey 1895

(Plate XXXV, fig. 1; Plate XXXVI, fig. 5)

1895. *Listronotus scapularis* Casey, Coleop. Notices VI, Ann. N. Y. Ac. Sci. VIII, p. 828.
1920. *Listronotus scapularis* Casey. Leng, Catalogue of the Coleoptera of America, North of Mexico, p. 316.
1931. *Listronotus scapularis* Casey. Schenkling and Marshall, *in* Junk, Coleopterorum Catalogus, Subfam. Cylindrorrhininae, Pars 114, p. 12.

ORIGINAL DESCRIPTION. "Parallel and somewhat stout, moderately convex, black, densely clothed throughout with brown scales nearly uniform in color, on the pronotum slightly larger, but not obscuring the punctures and slightly paler in a feeble oblique line at each side and in the middle toward the base. Head a little less than one-half as wide as the prothorax, densely fulvo-squamulose, the eyes separated by nearly four times their own width; beak long, about as long as the head and prothorax, straight, bent downward and gradually

dilated toward the tip, tricarinate above, squamose and densely punctato-rugose throughout; antennae long and slender, inserted near the apex, the scrobes long, deep, coarse, straight, and horizontal, scape very long, slender, feebly enlarged distally, second joint of funicle greatly elongate, more than twice as long as the first and almost as long as the next four combined. Prothorax two-fifths wider than long, the sides subparallel, conspicuously and almost evenly arcuate, a little more convergent toward apex than base, the former three-fourths as wide as the latter, truncate, the ocular lobes well developed; base broadly arcuate; disk sparsely, moderately coarsely punctate, each puncture bearing a small, stiff hair. Scutellum circular, densely clothed with pale whitish scales. Elytra three-fifths longer than wide, between three and four times as long as the prothorax and nearly one-half wider; sides parallel and straight behind the post-humeral projection, outwardly oblique and straight from the base to the apex of the angulate prominence, gradually rounded in about apical third, the subapical umbones well marked; disk finely striate, the striae finely, feebly and indistinctly punctate; intervals flat, finely, sparsely punctate, each puncture bearing a small stout hair. Abdomen densely squamose on the two basal segments, thence coarsely pubescent with squamose sublateral areas to the apex; legs long, densely squamose and with short stiff sparse hairs, the scales paler toward the femoral apices. Length, 12.0 mm.; width, 5.0 mm. (across the post-humeral angular prominences 5.5 mm.).

"Texas (El Paso). Mr. Dunn.

"This large and distinct species may be placed near *callosus* Lec., for the present, but is not closely allied to any other thus far described. The type is probably a female. Two specimens."

ADDITIONAL DESCRIPTION. *Length,* 8 to 12 mm. Thickly clothed with nearly uniform brownish scales, larger on prothorax, smaller and imbricated on elytra. In fresh specimens the following markings of light scales may be observed: a narrow irregular oblique line at each side of the prothorax, and a short median line at the base; a wider irregular band on the elytra, covering the humeri and extending caudad over the posterior calli. Occasionally there may be scattered small patches of light scales on the disk of the elytra. The extent of the light scales is variable and in some specimens there are very few present. On older specimens the light scales may become saturated with oil from the body, in which case they become dark or dirty, and the patterns are obliterated. *Beak* tricarinate

above, median carina prominent, sharp, smooth; lateral carinae less prominent, more rounded, closely punctate. *Antennae* with second segment of funicle about twice as long as first, third longer than fourth, second almost as long as next four combined, as stated in original description. *Head* convex, finely and closely punctate, densely covered with elongate scales, becoming rounded in the area immediately surrounding the frontal fovea, which is deep and punctiform. Disk of *prothorax* closely, moderately coarsely punctate, each puncture closed by a scale; a few scattered punctures larger, open, and bearing short setae. The original description mentions only these latter punctures, not the smaller ones which are covered over by the scales. Base of *elytra* deeply emarginate. *Female* with tips of elytra separately, very slightly subacuminate; seventh abdominal sternum very slightly emarginate at apex, nearly truncate, with an oblong median transverse depression which is impunctate and somewhat shining at the middle.

NOTES ON TYPES. The types of this species are located in the Casey Collection in the United States National Museum, and have been examined. The type is a female from "Tex." A paratype male is also labeled "Tex." There is a third specimen in the series, a male, not a type, and without any locality label, although it is undoubtedly from Texas.

REMARKS AND COMPARATIVE NOTES. This species has been found confused in collections with *L. callosus* LeConte which it resembles. It may be readily distinguished by the prominent post-humeral projections and the flat intervals of the elytra. The prothorax is relatively wider, being three-fifths wider than long while in *L. callosus* LeConte the prothorax is only one-fifth wider than long. The genitalia of the two species are very distinct.

BIOLOGICAL NOTES. This species has been taken at light.

DATA ON DISTRIBUTION. Known to occur only in Texas.

Texas:

Tex.; Gregory, Tex., June 8, '04, at light; San Diego, Tex., May 23, Coll. Hubbard & Schwarz; San Diego, Tex., May 25, E. A. Schwarz Collector; Mercedes, Tex., May 11-1934, C. L. Parnell, Thayer #161; Kingsville, Tex., C. T. Reed; Taft, Tex., 5/13/10; Brwnsvlle., Tex., XI-5, McMillan, Collector, under board; Brownsville, Tex., VI-25-08; Brownsville, Tex., Oct. 12, 1910, R. A. Vickery Collector, Webster No. 6478; Brownsville, Tex., VI-8-34, J. N. Knull; Victoria, Tex., 5-18-'04, C. M. Walker Collector; Victoria, Tex., V.14. 11, J. D. Mitchell, Collector, at light; McAllen, Tex., VII-9-1921, L. J. Bottimer, at light; Hidalgo Co., Tex., 6-16-1930, Light Trap Tex. Exp. Sta.; Hidalgo Co., Tex., 6-5-1930, J. C. Gaines Collector, Tex. Exp. Sta. Light Trap; Weslaco, Tex., 6-5-1930; Weslaco, Tex., 5-30-1930, S. W. Clark Collector, Tex.

Exp. Sta. Light Trap; Weslaco, Tex., Oct., 1930, S. W. Clark; Plainview, Tex., 10-1-31, S. E. Jones Collector; Brownsville, Tex., Feb. 26, 1915, C. H. Popenoe Collector; Brownsville, Tex., VI-1-34 and VI-8-34, J. N. Knull; Brownsv'le, Tex., VI, 11-16, '33, Darlington; Dallas, Texas.

Listronotus blatchleyi new species

(Plate XXXV, fig. 2; Plate XXXVII, fig. 12)

1928. *Listronotus callosus* Blatchley, *nec* LeConte. Blatchley, Jr. N. Y. Ent. Soc., XXXVI, p. 241.

Length, 9 to 12.5 mm. Oblong, stout, black. Clothed with dark-brown and light-brown scales, the latter forming an irregular lateral vitta on the prothorax and extending onto the humeri of the elytra and sometimes to the posterior third of the elytra. In some individuals these light-brown scales become almost cinereous. *Beak* moderately stout, very slightly curved, as long as the prothorax; upper surface distinctly tricarinate; lateral sulci very deep; surface rugulosely punctate; clothed with narrow scales. *Head* convex, densely punctate, clothed with narrow scales; rugose between the eyes and with the scales wider; frontal fovea very deep. *Antennae* moderately slender; second segment of funicle nearly twice as long as first; third segment very slightly elongate, not as long as first; fourth to seventh segments rounded. *Prothorax* slightly wider than long; ocular lobes moderately developed; sides nearly parallel at middle, strongly rounded at base, slightly constricted at apex; disk of prothorax more sparsely squamose than elytra, the scales much larger than those of the elytra but not imbricated; the surface densely and coarsely punctate, a few scattered larger punctures open and seta-bearing; sides of prothorax granulate-punctate. *Scutellum* elongate, clothed with tiny whitish setae. *Elytra* deeply emarginate at base; humeri right-angulate or very slightly oblique, prominent because of the deeply emarginate base of the elytra; rounded behind the humeri, sides parallel in the male, very slightly wider a little behind the middle in the female; striae not impressed, but coarsely and deeply punctate; intervals convex, the third and fifth usually very strongly so; elytra with a very rough appearance caused by numerous prominent transverse wrinkles; setae rather short, decumbent, not very prominent. *Ventral surface* sparsely and unevenly punctate with intermixed large and small punctures; sterna nearly bare at middle, having only a few short, slender, inconspicuous setae, but with the sides rather thickly clothed with rounded scales. *Legs* rather slender; middle and hind femora with a preapical band of light scales; tibiae strongly mucronate at apex. *Male* with third and fourth (first and second visible) abdominal

sterna broadly concave; seventh (fifth visible) sternum slightly convex; elytra conjointly rounded. *Female* with third and fourth (first and second visible) abdominal sterna very strongly convex throughout their entire width; seventh (fifth visible) sternum rather broadly and deeply transversely concave; seventh tergum broadly and shallowly emarginate at apex; tips of elytra separately acuminate.

Notes on Types. Holotype male and allotype female, "Homestead, Fla., June, 1929, Darlington." Six paratypes as follows: 2 females, "Homestead, Fla., June, 1929, Darlington"; 1 male, "Flagler Co., Fla., 11-18-30, D. B. Webb, Florida Fruit Fly Trap Surv."; 1 male, "Paradise Key, Fla., IV-1-25"; 2 females, "Royal Palm Park, Fla., 12-12-24, W. S. B."

Holotype and allotype in the Museum of Comparative Zoölogy at Harvard College. Paratypes in the Museum of Comparative Zoölogy at Harvard College, the United States National Museum, the Francis Huntington Snow Entomological Collections at the University of Kansas, and in the collections of H. C. Fall and Purdue University.

Remarks and Comparative Notes. This species appears to be somewhat related to *L. callosus* LeConte, but may be separated from it by the following characters: beak more strongly tricarinate; fourth segment of funicle of antennae not elongate; elytra with transverse wrinkles and the odd intervals not as strongly convex; posterior calli not at all prominent.

L. blatchleyi n. sp. appears to be most closely related to *L. palustris* Blatchley. The two species are very similar in many respects, but may be separated by the following characteristics: alternate elytral intervals less convex in *palustris* than in *blatchleyi;* beak equal in length to the prothorax in *blatchleyi,* longer than the prothorax in *palustris;* all the tibiae denticulate along the inner margins in *blatchleyi,* hind tibiae not denticulate in *palustris;* elytra with transverse wrinkles in *blatchleyi* but not in *palustris.* The two species may be separated readily by the differences in the median lobes of the males or the eighth sterna of the females.

Blatchley (1928) refers to *L. blatchleyi* n. sp. under the name of *L. callosus* LeConte. Since Blatchley has collected the species and published on it, it is named for him.

Biological Notes. Blatchley (1928), in referring to the two specimens of this species which were collected by him says, "Two females, each 13 mm. in length, were taken December 12, hibernat-

ing amidst the roots of a large tuft of roadside grass at Royal Palm Park." These two specimens have been examined and are designated as paratypes.

DATA ON DISTRIBUTION. Known only from Florida.

Listronotus palustris Blatchley 1916

(Plate XXXIII, fig. 4; Plate XXXVI, fig. 10)

1916. *Listronotus palustris* Blatchley, *in* Blatchley and Leng, Rhynchophora of North Eastern America, p. 161, fig. 60 a-b.

1920. *Listronotus palustris* Blatchley. Leng, Catalogue of the Coleoptera of America, North of Mexico, p. 317.

1931. *Listronotus palustris* Blatchley. Schenkling and Marshall, *in* Junk, Coleopterorum Catalogus, Subfam. Cylindrorrhininae, Pars 114, p. 12.

ORIGINAL DESCRIPTION. "Elongate-oblong, robust. Black, above rather thickly clothed with pale brown, fuscous and silvery gray scales, the gray ones forming a narrow stripe each side of thorax and along the sides to beyond the middle of the elytra, covering also the meso- and metasternal side pieces and sides of ventral segments, and forming a ring near apex of each femur; antennae, tibiae and tarsi dark reddish-brown. Beak rather stout, as long as thorax, distinctly tricarinate and quadrisulcate. Thorax short, convex, distinctly wider than long, sides broadly rounded, disc coarsely, evenly and densely punctured, each puncture closed by a round scale, much larger than those of elytra. Scutellum small, rounded. Elytra but slightly wider at base than middle of thorax, humeri oblique, sides subparallel to apical third, then strongly converging to apex where they are conjointly rounded in male, but separately prolonged in short, obtuse processes in female; striae with very coarse punctures separated by their own diameters; first, third and fifth intervals convex, slightly elevated, the others flat; setae very short, visible only on the declivity. Fifth ventral of female broadly and deeply impressed. Length, 6.2-8.5 mm.

"Dunedin, Florida, Jan. 17-April 6; common beneath boards and other cover along the margins of ponds; mating Feb. 11 and April 1. Enterprise, Fla., May 25; LeConte collection, without name. Marion county and Enterprise, Fla., May 27; Horn collection, without name. Specimens sent to Doctor Chittenden were returned as *L. sulcirostris* Lec., but careful comparison with the type of that species shows *palustris* to differ widely in the secondary sexual characters of female, as well as in the width, vestiture and punctuation of thorax."

ADDITIONAL DESCRIPTION. *Length,* 6.5 to 9 mm. *Beak* as long as or slightly longer than prothorax; median carina smooth, usually more prominent than lateral carinae, which are punctate; lateral

sulci deep, extending beyond middle of beak; upper surface rather thickly clothed with narrow scales and a few slender setae. *Head* convex; deeply and densely punctate; clothed with short stout setae; frontal fovea deep, with a small patch of rounded scales. *Prothorax* one-fifth wider than long; disk with a number of scattered large punctures bearing short, stout setae instead of rounded scales. *Male* with third abdominal sternum slightly concave; entire surface of seventh sternum convex, often with a short median longitudinal depression just before the apex. *Female* with third abdominal sternum slightly convex; seventh sternum with a moderately deep concavity across its entire width.

NOTES ON TYPES. The types of this species, a male and female, were found mating at Dunedin, Fla., April 1, 1915, and were collected by W. S. Blatchley. They are located in the Blatchley collection at Purdue University.

BIOLOGICAL NOTES. Several specimens have been taken from the stomachs of *Bufo terrestris* at Lake Kissimmee, Florida. There is a specimen of *L. palustris* Blatchley in the Harris collection in the Boston Museum of Natural History. It had not been determined as any species. A number on the specimen refers to the Harris catalogue, where we find that the specimen was taken under the bark of a rotten oak in "E. Fla.," by Doubleday.

DATA ON DISTRIBUTION. Described and previously recorded only from Florida. I have seen several specimens from two localities in Georgia. The records of distribution are as follows:

Georgia:

St. Simons Island, Ga., 18-VII-1931, Quirsfeld; St. Simons Island, Ga., VII-18-1931, C. A. Frost; Tybee Is., Ga., 7.1, H. A. Wenzel Collector.

Florida:

Fla.; Dunedin, Fla., 1.2.1918, 1-19-1913, 2-11-1913, 2-17-20, Feb. 18, 1914, 2-21-16, 2-23-24, 3-2-16, Mch. 14. '20, 3-15-1913, 3-16-1913, 3-18-16, 3-31-1913, 4-1-1915, and 4-2-21, W. S. Blatchley Coll.; Dunedin, Fla., II.11.14, II-11-'17, and II-26-16; Dunedin, Pinellas Co., Fla., III-17-1925; Enterprise, Fla., 25.5 and 27.5, Coll. Hubbard & Schwarz; Enterprise, Fla., May 19, May 21, May 23, May 25, and May 27; Tampa, Fla., 26.4, Coll. Hubbard & Schwarz; Tampa, Fla., 28.4; Sebring, Fla., 8-5-30, Paul W. Oman; Lake Kissimmee, Fla., Bufo 1387; Lake Kissimmee, Fla., Bufo 1390; Lake Kissimmee, Fla., Bufo 1438.

Listronotus blandus new species

(Plate XXXIV, fig. 1; Plate XXXVII, fig. 1)

Length, 5.25 to 6.5 mm. Elongate, black. Clothed with rather large, round scales, nearly uniform in color except on the prothorax, where there are indications of three vittae which are a trifle lighter.

Beak very slightly longer than the prothorax; with three fine carinae, the median one a trifle more prominent; the lateral sulci moderately deep; rather sparsely and somewhat rugulosely punctate, especially at the base; basal part with a few round scales which become narrower at the middle of the beak and setiform at its apex. *Head* convex; densely punctate, slightly rugose between the eyes; clothed with short slender setae; frontal fovea deep, with a small patch of broad scales. *Antennae* slender; second segment of funicle nearly twice as long as first; third segment very slightly elongate in male, more so in female; fourth to seventh segments rounded. *Prothorax* slightly wider than long; ocular lobes moderately developed; sides evenly rounded; disk coarsely punctate, sparsely clothed with scales which are very little larger than those of the elytra; a few large, open punctures bearing short, stout setae. *Scutellum* nearly round, with a few very short, stout light-colored setae. Base of *elytra* broadly and slightly emarginate; humeri obtuse, rounded; sides parallel to the posterior third then gradually narrowed to the apex, the posterior third being rather slender and slightly attenuated; striae slightly impressed, finely punctate; intervals slightly convex, with short, distant setae. *Ventral* surface with third and fourth (first and second visible) abdominal sterna coarsely and very sparsely punctate, the median part with tiny setae scarcely protruding beyond the punctures, sides with a small patch of round scales; fifth to seventh (third to fifth visible) sterna more finely and closely punctate, and with minute setae. *Legs* slender; tibiae rather strongly bent at tip, apical mucrones long. *Male* with third (first visible) abdominal sternum flat or very slightly concave; tips of elytra conjointly rounded. *Female* with third (first visible) abdominal sternum convex; seventh (fifth visible) sternum with a broad, transverse concavity extending across the entire sclerite; tips of elytra separately subacuminate.

NOTES ON TYPES. Holotype male, "Ind. River, Fla., 9/4." Allotype female, "Childs, Fla., 8-6-30, R. H. Beamer." Numerous paratypes from Florida, Georgia, Alabama, and Louisiana.

Holotype and allotype in the Francis Huntington Snow Entomological Collections at the University of Kansas. Paratypes in the Francis Huntington Snow Collections, the United States National Museum, the Museum of Comparative Zoölogy at Harvard College, the American Museum of Natural History, and in the collections of the United States Biological Survey, Purdue University, H. C. Fall, and the Illinois Natural History Survey.

REMARKS AND COMPARATIVE NOTES. This species is fairly closely related to *L. palustris* Blatchley, but is much smaller, has the beak less coarsely sculptured, has the scales of a uniform color, and the elytral intervals are not convex as in *L. palustris* Blatchley.

BIOLOGICAL NOTES. This species has been taken in some numbers from the stomachs of *Bufo terrestris* at Lake Kissimmee, Florida. A specimen from Ponchatoula, La., was collected on turnip on May 2. This species has been taken at light in Louisiana.

DATA ON DISTRIBUTION. Rather common in Florida. Has also been taken in Georgia, Alabama, and Louisiana.

Listronotus frontalis LeConte 1876

(Plate XXXII, fig. 3; Plate XXXVII, fig. 13)

1876. *Listronotus frontalis* LeConte, Proc. Am. Phil. Soc., Vol. XV, p. 133.
1885. *Listronotus frontalis* LeConte. Townsend, Can. Ent., Vol. XVII, p. 72.
1895. *Listronotus frontalis* LeConte. Hamilton, Trans. Am. Ent. Soc., XXII, p. 344.
1910. *Listronotus frontalis* LeConte. Smith, Insects of New Jersey, p. 382.
1916. *Listronotus frontalis* LeConte. Blatchley and Leng, Rhynchophora of North Eastern America, p. 159.
1920. *Listronotus frontalis* LeConte. Leng, Catalogue of the Coleoptera of America, North of Mexico, p. 317.
1928. *Listronotus frontalis* LeConte. Leng, Cornell Univ., Agri. Exp. Sta., Memoir 101, p. 495.
1931. *Listronotus frontalis* LeConte. Schenkling and Marshall, *in* Junk, Coleopterorum Catalogus, Subfam. Cylindrorrhininae, Pars 114, p. 11.
1937. *Listronotus frontalis* LeConte. Blcasdell, Iowa St. Coll. Jr. Sci., Vol. XI, No. 4, p. 416.

ORIGINAL DESCRIPTION. "Blackish, less elongated, covered with rounded scales, which are no larger on the prothorax; these scales are dirty brown on the elytra, and with a metallic lustre on the head and prothorax. Beak finely carinate, lateral grooves almost obsolete, frontal fovea deep. Prothorax very little longer than wide, broadly rounded on the sides, transversely impressed near the tip; lateral stripes and dorsal line indistinctly paler, punctures dense, of two sizes, the larger more distant. Elytra one-third wider than the prothorax, broadly emarginate at base, humeri rounded; striae strongly punctured, interspaces wide, nearly flat; tip conjointly rounded in both sexes. Length, 5.7-10 mm.; .23-.40 inch.

"Male. Last ventral not impressed; anal segment slightly prominent.

"Female. Last ventral with three shallow impressions.

"Michigan, New York, Georgia, Texas. Stouter than *L. nebulosus,* and easily recognized by the above characters. The setae of the elytra are more obvious than usual."

ADDITIONAL DESCRIPTION. *Beak,* about the same length as the prothorax, moderately stout; upper surface rounded, except for the

sharp smooth median carina; surface rather densely, moderately punctate. *Antennae* with second segment of funicle about twice as long as first; third to seventh segments subglobose, third not longer than fourth and not as long as first. Disk of *prothorax* slightly wider than long; ocular lobes moderately developed; punctures dense, rather small, with a few scattered larger punctures bearing short, dark, stout setae instead of scales. *Elytra* with striae rather fine, moderately punctate, the punctures not distant; intervals nearly flat, scales not imbricated, setae moderately long, dark, semierect, rather prominent on posterior part of elytra. *Ventral surface* of abdomen not densely punctate; seventh sternum, however, more densely punctate than the others; punctures of varied size. *Male* with third and fourth sterna broadly and rather deeply concave at middle; seventh sternum nearly flat; disk of prothorax with only a slight median postapical impression. *Female* with third and fourth sterna flat or slightly convex; seventh sternum with three broad, feebly impressed longitudinal impressions, one median and the other two sublateral; disk of prothorax with a median postapical impression which is often rather deep.

NOTES ON TYPES. The types of this species have been examined. They are in the LeConte collection in the Museum of Comparative Zoölogy at Harvard College. There are four specimens in LeConte's series of *frontalis*. The first one is a female labeled "Tex." It is 9.5 mm. long. There is a deep impression just behind the apex of the prothorax. The second specimen is from the "middle states" of LeConte and is probably the New York specimen mentioned in the original description. It is a male, and measures 6.2 mm. in length. The scales are slightly tinged with cupreous. The third of the series is a female and bears an orange disk indicating the "southern states," probably Georgia. The fourth specimen in the series is labeled "S. Haven, Mich., 15.9.74." It does not bear a type label, but is probably the specimen, or one of the specimens, upon which the Michigan record in the original description is based.

Biological notes. Sometimes taken at light. It was taken by Mitchell in Victoria county, Texas, in the early part of February, hibernating under pecan logs. Townsend (1885) found a number of *L. frontalis* LeConte in Louisiana, along with *L. tuberosus* LeConte, *L. callosus* LeConte, and *L. nebulosus* LeConte, beneath old railroad ties on the ground and under pieces of wood in dry places during the first part of April. Blatchley (1916) records the species as frequent along the beach of Lake Michigan and along the borders of ponds and ditches.

DATA ON DISTRIBUTION: This species has a very wide distribution. It has been found from Florida to California, northward through the entire United States, and in all the southern tier of Canadian provinces, from Quebec to British Columbia. The records of specimens examined are as follows:

UNITED STATES

Massachusetts:

Mass.; Chicopee, Mass., Apr. 12, '95, Apr. 23, '95, May 31, '95, June 9, '96, June 20, '95, and June 30, '95; Tyngsboro, Ms., VI-16-21; Mass., Blanch.; Low., Mass.

Rhode Island:

Watch Hill, R. I., July 31, 1909, W. Robinson.

New York:

N. Y., T. B. A.; Buffalo, N. Y.; Rochester, N. Y., 23 July, 1933, Coll. R. L. Post.

New Jersey:

Berkley Hgts., N. J.; New Jersey; Hopatcong, N. J.

Pennsylvania:

Penn.; Jeanette, Pa., Klages; Frankford, Pa., VI.21, and VI.27, A. Schmidt Collector.

District of Columbia:

Washgtn., D. C.

Florida:

Fla.; Lake Kissimmee, Fla., Bufo 1428.

Alabama:

Mobile, Ala., VI, Loding; Mobile, Ala., VII.1.21, H. P. Loding.

Louisiana:

La.; N. Orleans, La., 11/3, 14/3, 26/3, 3.VI.92, 6/6, 10/6, 26.X.91, and 4/11/91; New Orleans, La., Aug. 3, F. R. Mason; Baton Rouge, La., June 4-15, T. H. Jones Collector, At light; Baton Rouge, La., May 5-19. O. W. Rosewall; Baton Rouge, La., 4/17/1934, 4/18/1934, 4/23.1934, 5/12.1934, F. E. Lyman; Gueydan, La., May 28, May 29, June 15, June 16, June 28, July 11, July 21, and Aug. 16, 1925, E. Kalmbach, At Light.

Kentucky:

Ky.

Indiana:

Ind.; Millers, Ind., VII.4.14.

Illinois:

Ill.; N. Ill.; Chicago, Ill., 3/9, VII.4.00; Cook Co., Ill., Aug., Blackwelder; Cook Co., Ill., Col. & Pres. by E. B. Chope; Ft. Sheridan, Ill., VII.25.10; Ravinia, Ill., VII.30.10.

Michigan:

Mich.; Cheboygan Co., Mich., 7-6-1936, R. L. Anderson; Oakland Co., Michigan, VII-4-1925, A. W. Andrews; Escanaba, Mich., 17.7; S. Haven, Mich., 15.9.74; Chippewa county, Michigan, VII.24.1914, A. W. Andrews.

Wisconsin:

Wis.

Minnesota:

Minn.

Iowa:

Iowa; Iowa, Bufo 2052; Iowa City, III-25-98, Wickham; Iowa City, Ia., V-5-1896; Lake Okoboji, Ia., July 3, July 10, and July 26, 1917, L. L. Buchanan; Monona Co., Iowa, IX-99, Shimek; Milford, Ia., Bufo am. 1997 (Lakeside Lab., F. N. Blanchard).

Nebraska:

Fillmore, Neb.

Kansas:

Kan.; Kan., T.B.A.; Lawrence, Kan., 7-11-33, M. W. Sanderson, At Light.

Texas:

Tex.; Victoria, Tex., 3.19, E. A. Schwarz Collector; Victoria, Tx., V.14.11, J. D. Mitchell Collector, at light; Calletto cr. bottom, Victoria Co., Tex., II-3-12, J. D. Mitchell Collector, hibernating under pecan log; Dallas Co., Tex., summer, 1931, J. K. G. Silvey.

Colorado:

Alamosa, Col., 3.7; Col.

North Dakota:

Granna, N. D., VI-25-'12, 106242; University, N. D., June 15.96, R. P. Currie Collector.

South Dakota:

S. D.

Utah:

Dry Lake, Ut., 7/31/1926, G. F. Knowlton Collector.

New Mexico:

Albuquerque, N. Mex.

Arizona:

Ari.

California:

Cal.

Oregon:

Or.; Dalles, Oreg.; Dalles, Or.; The Dalles, Oreg., 1889, Dietz; Baker, Ore., Je.15, 1924; Klamath, Oreg.

Washington:

Pullman, Wash., July 2, '98, Collector C. V. Piper.

CANADA

Quebec:

Montebello, Que., 7-24-37.

Ontario:

E. Ont., Can.

Saskatchewan:

Saskatoon, Sask., June 16, 1924, Kenneth M. King.

Alberta:

Cypress Hills, Alta., VII.3.1925, F. S. Carr; Medicine Hat, Alta., 30.IV.1927, F. S. Carr Collector; Medicine Hat, Alta., VI-17-'27, Carr.

British Columbia:

Salmon Arm, B. C., 30.IV.31 and I.5.1930, Hugh B. Leech; Osoyoos, B. C.; Vancouver Is., B. C.

Listronotus oregonensis (LeConte) 1860

(Plate XXXIII, fig. 1; Plate XXXVII, fig. 6)

1860. *Listroderes oregonensis* LeConte, Explorations and Surveys for a Railroad Route from the Mississippi River to the Pacific Ocean. Route Near the 47th and 49th Parallels, XII, pt. 3, p. 55.

1871. *Listroderes oregonensis* LeConte. Gemminger and Harold, Catalogus Coleopterorum, VIII, p. 2360.

1873. *Listoderes oregonensis* LeConte. Crotch, Check List of the Coleoptera of America, North of Mexico, p. 118.

1876. *Listronotus oregonensis* (LeConte). LeConte, Proc. Am. Phil. Soc., XV, p. 133.

1876. *Listronotus latiusculus* LeConte, *nec* Boheman. Proc. Am. Phil. Soc., XV, p. 134.

1876. *Listronotus impressifrons* LeConte, Proc. Am. Phil. Soc., XV, p. 134.

1877. *Listronotus latiusculus* LeConte, *nec* Boheman. Popenoe, Trans. Kan. Acad. Sci., V, p. 39.

1902. *Listronotus latiusculus* LeConte, *nec* Boheman. Chittenden, U. S. D. A. Yearbook, p. 731.

1903. *Listronotus latiusculus* LeConte, *nec* Boheman. Ulke, Proc. U. S. N. M., XXV, p. 33.

1909. *Listronotus latiusculus* LeConte, *nec* Boheman. Chittenden, U. S. D. A., Bur. Ent. Bull. 82, Pt. 2, pp. 14-19, figs. 3a, 3b, 3c, 3d, 4.

1914. *Listronotus latiusculus* LeConte, *nec* Boheman. Britton, 13th Rept. St. Ent. Conn., p. 252, Pl. XI, b.

1916. *Listronotus latiusculus* LeConte, *nec* Boheman. Blatchley and Leng, Rhynchophora of North Eastern America, p. 161, fig. 61.

1916. *Listronotus impressifrons* LeConte. Blatchley and Leng, Rhynchophora of North Eastern America, p. 163.

1916. *Listronotus rudipennis* Blatchley, *in* Blatchley and Leng, Rhynchophora of North Eastern America, p. 162.

1920. *Listronotus latiusculus* LeConte, *nec* Boheman. Britton, Conn. Geol. and Nat. Hist. Surv., Bull. 31, p. 283.

1920. *Listronotus oregonensis* (LeConte). Leng, Catalogue of the Coleoptera of America, North of Mexico, p. 317.

1920. *Listronotus latiusculus* LeConte, *nec* Boheman. Leng, Catalogue of the Coleoptera of America, North of Mexico, p. 316.

1920. *Listronotus impressifrons* LeConte. Leng, Catalogue of the Coleoptera of America, North of Mexico, p. 317.

1920. *Listronotus rudipennis* Blatchley. Leng, Catalogue of the Coleoptera of America, North of Mexico, p. 317.

1922. *Listronotus latiusculus* LeConte, *nec* Boheman. Hayes, Trans. Kan. Acad. Sci., XXX, 2, p. 207.

1924. *Listronotus latiusculus* LeConte, *nec* Boheman. Chittenden, Bull. Brook. Ent. Soc., XIX, pp. 84-86, fig.

1926. *Listronotus latiusculus* LeConte, *nec* Boheman. Chandler, Jr. Econ. Ent., XIX, pp. 490-494.

1926. *Listronotus rudipennis* Blatchley. Harris, Jr. Econ. Ent., XIX, pp. 494-496, pl. 7.

1927. *Listronotus latiusculus* LeConte, *nec* Boheman. Boyce, Jr. Econ. Ent., XX, pp. 814-821, fig. 39.

1927. *Listronotus latiusculus* LeConte, *nec* Boheman. Britton, Conn. Agri. Exp. Sta., Bull. 285, p. 173.

1928. *Listronotus latiusculus* LeConte, *nec* Boheman. Leng, Cornell Univ. Agri. Exp. Sta., Memoir 101, p. 495.

1931. *Listronotus oregonensis* (LeConte). Schenkling and Marshall, *in* Junk, Coleopterorum Catalogus, Subfam. Cylindrorrhininae, Pars 114, p. 12.

1931. *Listronotus lotiusculus* LeConte, *nec* Boheman. Schenkling and Marshall, *in* Junk, Coleopterorum Catalogus, Subfam. Cylindrorrhininae, Pars 114, p. 12.

1931. *Listronotus impressifrons* LeConte. Schenkling and Marshall, *in* Junk, Coleopterorum Catalogus, Subfam. Cylindrorrhininae, Pars 114, p. 11.

1931. *Listronotus rudipennis* Blatchley. Schenkling and Marshall, *in* Junk, Coleopterorum Catalogus, Subfam. Cylindrorrhininae, Pars 114, p. 12.

1932. *Listronotus latiusculus* LeConte, *nec* Boheman. Buchanan, Bull. Brook. Ent. Soc., XXVII, pp. 7-8.

1933. *Listronotus latiusculus* LeConte, *nec* Boheman. Britton, Conn. Agri. Exp. Sta. Bull. 344, p. 137.

1935. *Listronotus latiusculus* LeConte, *nec* Boheman. Shropshire and Compton, Ill. Agr. Coll. Exp. Sta. and Ext. Serv., Circ. 437.

1935. *Listronotus rudipennis* Blatchley. Shropshire and Compton, Ill. Agr. Coll. Exp. Sta. and Ext. Serv., Circ. 437.

1937. *Listronotus latiusculus* LeConte, *nec* Boheman. Bleasdell, Iowa St. Coll. Jr. of Sci., XI, 4, p. 416.

1938. *Listronotus latiusculus* LeConte, *nec* Boheman. Pepper and Hagmann, Jr. Econ. Ent., XXXI, pp. 262-266.

ORIGINAL DESCRIPTION. "Niger oblongus, sordide squamosus, rostro thorace vix breviore, confertim punctato et rugoso, subtiliter carinato, capite confertim punctato, thorace grosse confertissime punctato, latitudine vix breviore, lateribus roundatis, antrorsum angustato ad apicem transversim paulo impresso, elytris thorace latioribus ad basin truncatis, latitudine sesqui longioribus, humeris paulo rotundatis, striis punctatis, interstitiis confertim punctulatis; antennis nigris, articulo 3io secundo fere duplo longiore. Long. ·27; lat. elytrorum ·11.

"One specimen, Shoalwater Bay, Dr. Cooper. The scales are nearly all removed by the spirits in which it was preserved."

ADDITIONAL DESCRIPTION. Length, 4.5 to 7 mm. Body black or piceous. Scales dark brown, light brown, or with a metallic coppery tinge in some specimens; scales imbricated on elytra but not on prothorax; occasionally a faint indication of a lighter median longitudinal vitta and two sublateral vittae on the prothorax; elytra sometimes without markings, other times with varied amounts of mottlings of darker scales which become almost black in some individuals. *Beak* rather variable; as long as or slightly longer than the prothorax; always with a median carina which may be feeble or very sharp; lateral carinae sometimes rather prominent; upper surface finely, densely, somewhat rugosely punctate; clothed with slender setae. *Head* convex, densely punctate; frontal fovea distinct. *Antennae* with second segment of funicle not quite twice as long as first; third rounded, not longer than fourth and not as long as first. *Prothorax* one-sixth to one-fifth wider than long; sides usually strongly rounded, sometimes slightly constricted at apex; ocular lobes not very strongly developed; disk of prothorax rather roughly sculptured, densely punctate with rather coarse punctures covered by large striate scales, the intervals between the punctures

with numerous tubercles, each bearing a stout seta inserted in a small puncture on its dorsal surface; disk of prothorax usually with a feeble median longitudinal impression which is more distinct toward the base and apex than at the middle. *Elytra* rather stout; very slightly emarginate at base; humeri rounded; sides parallel to apical third, then broadly rounded to apex, which is rather blunt, or subtruncate; striae slightly impressed, the punctures small, closely placed, each bearing a tiny seta; intervals flat or slightly convex, the first two slightly depressed around the scutellum, the third usually more strongly convex at base, each interval with a row of short setae which are a little longer and very slightly clavate toward the apex of the elytra. *Ventral surface* densely, moderately punctate; sides of metasternum with a few rounded scales, the remainder of the ventral surface clothed only with slender setae. *Male* with third and fourth abdominal sterna broadly and feebly concave at middle. *Female* with third abdominal sternum slightly convex; seventh sternum unmodified.

NOTES ON SYNONYMY. The *Listronotus latiusculus* of American authors is *L. oregonensis* (LeConte). The type of *Listroderes latiusculus* Boheman has been examined and is a member of the genus Hyperodes. Under the name of *Listronotus latiusculus* (Boheman), LeConte, in 1876, says, "I refer this name to a species which occurs in the Middle and Southern States, and is by no means rare." This statement is followed by a description of the species which must be known as *Listronotus latiusculus* LeConte, *nec* Boheman, since it does not refer to Boheman's *latiusculus*. *Listronotus latiusculus* LeConte is a synonym of *Listronotus oregonensis* (LeConte), both names having been proposed for the same species. The latter name has priority by sixteen years. The type of *Listroderes oregonensis* LeConte has been examined, as has also the series of specimens on which the name *Listronotus latiusculus* LeConte is based.

In 1876 LeConte described *Listronotus impressifrons*. The types of this species have been examined and *L. impressifrons* LeConte is found to be a synonym of *L. oregonensis* (LeConte).

Blatchley described *Listronotus rudipennis* in 1916. Buchanan (1932) placed *L. rudipennis* Blatchley as a synonym of *L. latiusculus* (Boheman), at the same time expressing the opinion that there was some doubt as to whether *L. latiusculus* (Boheman) was the proper name for the species. He also suggested that if an examination of the type of *Listroderes latiusculus* Boheman showed that the name had been erroneously applied to the species in question, the name *L. rudipennis* Blatchley would become available. I have examined

the type of *L. rudipennis* Blatchley and agree with Buchanan's conclusions regarding the synonymy of that species. I have also found, as was suspected by Buchanan, that the name *latiusculus* Boheman cannot be applied to this species. However, an examination of the type of *L. oregonensis* (LeConte) shows that it is the same species to which the name *L. rudipennis* Blatchley was applied, and since *L. oregonensis* (LeConte) was the first name applied to the species, it has priority over all others.

NOTES ON TYPES. The type of *L. oregonensis* (LeConte) is in the LeConte Collection in the Museum of Comparative Zoölogy at Harvard College. It is a female specimen and bears a blue disk indicating that it was taken in Oregon. The scales are nearly all gone, and the left elytron is broken from the body and mounted on a point on the pin beneath the body. There is a slight indication of the median thoracic impression mentioned by LeConte, but the appearance of the deepness of the impression is emphasized by the presence of some light scales at the bottom of the depression. These scales are the remnant of the lighter colored median vitta and were not rubbed off because they were protected by their location on the concave surface of the depression.

The types of *L. impressifrons* LeConte, and the specimens to which the name *L. latiusculus* LeConte, *nec* Boheman was applied are also in the LeConte Collection at Harvard College.

The type of *L. rudipennis* Blatchley is in the Blatchley Collection at Purdue University.

The type of *Listroderes latiusculus* Boheman is in the Zoölogisches Institut at Halle, Germany.

NOTES ON BIOLOGY. The first mention of any biological information concerning this species was by Popenoe (1877). He says that the species was common at Topeka, Kan., and that it was found under stones in the spring, and was taken on *Peucedanum faeniculaceum*. Specimens taken by Popenoe at Topeka, Kan., have been examined.

The first known mention of the species causing any economic damage was made by Chittenden (1902) when he reported that it was discovered by Mr. F. C. Pratt, injuring parsley in Virginia. Some of the specimens taken from the roots of parsley by Mr. Pratt at Four Mile Run, Va., have been examined. Chittenden (1909) later reported on the life history and habits of the species.

Britton (1914) reported the "parsley stalk weevil" as causing damage to parsley in cold frames in Connecticut.

Chittenden (1924) again published on the "parsley weevil," re-

porting damage which it had caused to carrots in New York and Washington, D. C. Some of the specimens which he mentions from Astoria, Long Island, New York, have been examined as have also some of those which he mentions as having been so abundant on parsley in Washington, D. C., in 1916. In this article Chittenden points out several times that these weevils were doing damage in dry soil, then says, ". . . it would naturally appear that the original supposition that this species was semiaquatic and that the attack to cultivated plants was accidental rather than otherwise should be modified. It is evident that we now have to deal with a species which is liable to be injurious to carrots or parsley at almost any time and place in its rather wide distribution." At the end of the article he says, "There would naturally be some slight doubt as to whether the species reared by Dr. C. M. Weed in Ohio from *Sagittaria* is the same as the one under discussion." The source of confusion here has been due to the fact that *Hyperodes solutus* (Boheman), reared from *Sagittaria* by Weed, was determined as *L. latiusculus* (Boheman). When the true *L. oregonensis* (LeConte), the *L. latiusculus* of American authors, was found living in parsley and carrots in comparatively dry ground, the contrast with the supposed semiaquatic habits of the species presented a perplexing situation.

Chandler (1926) reports serious damage to carrots in Illinois by this species and says that it is apparently single brooded in Illinois.

Using the name *L. rudipennis* Blatchley, Harris (1926) gives a report of damage to carrots in Iowa by this species. A short discussion of the life history is given, and there are brief descriptions of the egg, adult, and habits of the adult. Harris states that there are probably three generations a year, and that hibernation is apparently in the adult stage.

Boyce (1927) discusses the serious damage caused to carrots by this weevil in the market gardens on Long Island, New York. His report of the life history covers one season's study and is the most comprehensive that has been published. For a detailed description of the egg, larva, pupa, and adult, see page 816 of Boyce's paper. A discussion of the life history is given on pages 816 to 819. Boyce (1927, pp. 814, 815, and 819) assumes that the species has changed its host plant and oviposition habits, but this is not the case; the previous records involving Sagittaria as a host plant, as has been pointed out before, are based on another species of weevil. During the course of the study, adults were reared from larvae taken from carrot, wild carrot (*Daucus carota* L.), curled-leaved parsley, hymicha (Hamburg parsley, *Apium petroselinum* L.), and dill (*Ane-*

thum graveolens L.). Three generations with overlapping broods were found to develop on Long Island.

Pepper and Hagmann (1938) report the carrot weevil as a pest of celery in New Jersey. They found three generations a year developing on celery in New Jersey. A brief discussion of the life history is given. A study was made of the food plants of the weevil. In addition to the plants mentioned by Boyce (1927), adults were reared from larvae found in the following plants; celery (*Apium graveolens* L.), broad-leaf plantain (*Plantago major* L.), and patience dock (*Rumex patientia* L.). The following is quoted from Pepper and Hagmann (1938, p. 263): "Large numbers of arrowhead plants (*Sagittaria variabilis*) which grow along the drainage ditches in the celery fields were carefully dissected and no signs of grubs or their injury were present in these plants. This is contrary to the findings of Weed (1889) and others. Our survey, however, does not prove that *L. latiusculus* never attacks the arrowhead plant."

Although Pepper and Hagmann (1938) make the first report of the carrot weevil causing damage to celery, I have seen specimens from Kalamazoo, Mich., taken in May, 1934, which had been injuring newly set celery. Specimens reared from celery at Hackensack, N. J., have also been examined.

There is another host plant to be recorded for *L. oregonensis* (LeConte). Specimens have been examined from Biloxi, Miss., bearing the Truck Crop Number 1159, which had been collected by M. M. High on turnip. The extent of feeding or damage, if any, is not known to me.

A specimen of *L. oregonensis* (LeConte) has been examined which had been reared from carrot by Satterthwait at Webster Groves, Mo. The species had been determined by him as *L. sordidus* (Gyllenhal) and was recorded as such under the Webster Groves Number 20549.

Harris (1926, p. 495) says that although the adults possess well-developed wings and are apparently able to fly, no individual was ever observed to attempt to do so, but when disturbed would fall to the ground and lie motionless for a few moments before crawling away. Boyce (1927, p. 819) says, "The beetles have never been observed in flight although they have fully developed wings. An examination of their wings furnishes some evidence that they do not fly except under the most favorable conditions, as the wings appear to be inadequate to efficiently support in flight a body of such size. A study of the infestations also indicates that they do not fly ac-

tively, since they were found only in carrots planted on soil that was infested the previous year." Pepper and Hagmann (1938, p. 264) say, "As reported by Boyce (1927) and others, the adults are sluggish and invariably feign death when disturbed. There is no record in the literature of beetles having been observed in flight; however, the senior author has observed them on the wing. Four specimens which flew in the windows of a moving automobile were captured. Two adults were captured while in flight. From the above observations they seem to be poor fliers. Although the beetles fly, it is doubtful whether they migrate very far." Specimens have been seen which had been taken at light in New Jersey, District of Columbia, Montana, and Louisiana. I have taken specimens at Lawrence, Kan., which had flown to lights, but from what distance they had come is not known.

A number of specimens of *L. oregonensis* (LeConte) have been found in the stomach of *Bufo americanus* in the northern states and of *Bufo terrestris* in the southern states, during the course of the food habit studies conducted by the Bureau of Biological Survey.

DATA ON DISTRIBUTION. This species has a rather general distribution over most of the United States. Specimens have not been seen from the southwestern states, but the species may be present there. Material has been examined from the following localities:

UNITED STATES

New Hampshire:

Exeter, N. H., VI.24.24.

Massachusetts:

Cambridge, Mass., S. Henshaw; Nantucket, Mass., VIII.21.26, C. W. Johnson Collector; Framingham, Mass., C. A. Frost; Chicopee, M., May 31, 95, June 30, 95, and June 9.96; Chicopee, Mass.

Rhode Island:

Watch Hill, R. I., July 2, 1909, W. Robinson; Providence, R. I., IV-21-12, J. Nylen; Warwick, R. I., Mch. 24, 1900, E. E. Calder.

Connecticut:

Kent, Ct., VII-4-1925, C. A. Frost.

New York:

N. Y.; N. Y. City & vcty.; Buffalo, N. Y.; West Point, N. Y., May 5, 1907 and May 21, 1910, W. Robinson; L. I.; Rochester, N. Y., 18 Je. '32; Astoria, L. I., Aug. 1923, in carrot; Valley Stream, N. Y., 7/8/30, Reared ex. larvae in carrots; Long Beach, L. I., VI-16; Far Rockaway, L. I., 7/5/04; Babylon, N. Y., June 21, 1892 and June 30, 1892, G. D. Bradford; Charlotte, N. Y., 20.VI.1907, J. L. Zabriskie; Baren Is., L. I., 4.VII.1891, J. L. Zabriskie; Olcott, N. Y., 4-27-1924, VII.6.1921 and VII.10.1921, H. Dietrich; Moshalu, N. Y.

New Jersey:

N. J.; Orange, N. J., Je. 5, Elec. light; No. Arlington, N. J., III-17; Slt. Mdows, N. J.; Arlington, N. J., III-17; Arlington Mdws., N. J., III.20.1926, A. Nicolay; Boonton, N. J., VI.6.01; Peermont, N. J., 6/28/96; Hackensack, N. J., 1937, reared from Celery; "Upper" Montclair, N. J., VI.28.1924, A. Nicolay; Woodbury, N. J., 5.22.'96; Hopatcong, N. J.; Atlant. Cy., N. J., V-15, H. W. Wenzel Collector.

Pennsylvania:

Frankford, Pa.; Philadelphia, Pa., 6.18.97; Roxborough, Pa., IV.23.10 and VI.18.10; Hummelstn., Pa., VI-8, J. N. Knull Collector; Germant'n., Pa., V-31, F. R. Mason; Bethlehem, Pa., IV.12.03, G. W. Caffrey Collector; Glenside, Pa., VI.17.06; Media, Pa., XII.24.'15, timothy, A. F. S.; Penn.

District of Columbia:

D. C.; Washington, D. C., VI-22-'23, J. R. Greeley Coll., at light; Washington, D. C., 6.28.16, M. T. Van Horn Collector, Collected on Parsely; Washgtn., D. C., 15.10; Washgtn., D. C., Jul. 29-10, Bred from Carrot; Washington, D. C., 5/30/95, Electric light; Washington, D. C., June, 93; Washington, D. C., 19 June, 95, Chittenden Collector.

Virginia:

Four Mile Run, Va., 29 July, 1902, at roots of parsley (Pratt); Four Mile R., Va., Sept. 02, in roots of parsley; Falls Church, Va., VI.21.17; Rosslyn, Va., nr. Wash., D. C., Mar. 23, '23, M. T. Van Horn Collector; Rosslyn, 18.3.1923, H. S. Barber.

West Virginia:

W. Sulphur, W. Va., July 3.1912, W. Robinson.

North Carolina:

N. C.

Georgia:

St. Simons Island, Ga., 19-VII-1931, Quirsfeld.

Florida:

Fla.; Dunedin, Pinellas Co., Fla., III-17-1925; Dunedin, Fla., 1-20-17, W. S. B. Coll.; Bell Glade, Fla., July, 1926, M. D. Leonard, Coll.; Brighton, Fla., Okeechobee, June 16, 1929, Darlington; Winter Park, Fla., 1.29.29; Paradise Key, Fla., Mar. 9, H. Barber Collector; Sanford, Fla., Feb. 19-'27, F. M. Uhler; Belle Air, Fla.; Lake Kissimmee, Fla., Bufo 1387; Lake Kissimmee, Fla., Bufo 1434; Lake Kissimmee, Fla., Bufo 2301; Enterprise, Fla.

Alabama:

Baldwin Co., Ala., H. P. Löding; Mobile Co., Ala., V.4.20, H. P. Löding; Mobile Co., Ala, IV.9.18 and IX.28.18; Orchard, Ala., H. P. Löding; Magazine Pt., Ala., H. P. Löding.

Louisiana:

La.; N. Orleans, La., 14/3; Gueydan, La., June 20, 1925, June 28, 1925, July 1, 1925, July 11, 1925, and VI, 25-26, '25, E. Kalmbach, at light.

Mississippi:

Biloxi, Miss., 5-6-36, M. M. High Coll., Truck Crop N. 1159, on turnip.

Kentucky:

Frankfort, Ky., 6.9.89.

Ohio:

Cincinnatti, Oh., 14.VI.91; Springfield, O., 8.10.90; Put-in-Bay, O., Catamba Isl., C. H. Kennedy Collector; Put-in-Bay, O., VII-7-35, J. N. Knull Coll.; Put-in-Bay, O., VI-15-35, R. C. Osburn Coll.; Columbus, O., VII-20-35, J. N. Knull Coll.; Franklin Co., O., VI-28-35, D. J. Horror Coll.; Summit Co., Ohio, 6-19-1937 and 9-1-1937, Louis J. Lipovsky.

Indiana:

Ind.; Wolf Lake, Ind., VI.11.11, Col. by A. B. Wolcott.

Illinois:

N. Ill.; N. Ill., Webster; Cook Co., Ill., Col. & pres. by E. B. Chope; W. Pullman, Ill., V.10.03, Col. by W. J. Gerhard; Chicago, Ill., VI.14 and VII.13, Col. & pres. by W. J. Gerhard; Chicago, Ill., VI-6-18; Summit, Ill., Jun. 16, '06; Oregon, Ill., VII.8.05; Riverside, Ill., VI.8.13.

Michigan:

Detroit, Jun.; Detroit, Mich.; Kalamazoo, Mich., May, 1934, injuring newly set celery; Washtenaw Co., Mich., VI-11-1921, M. H. Hatch; Washtenaw Co., Mich., Botan. gardens, Ann Arbor, VI-11-1919, T. H. Hubbell; Marquette, Mich., 27.6, 28.6, 4.7, 6.7, 7.7, and 14.7; Harbert, Mich., Bufo am. 1984; Berrien Co., Mich., VII.11, T. H. Hubbell; Schoolcraft Co., Floodwood, Mich., July 21, 1915, A. W. Andrews.

Wisconsin:

Cranmoor, Wis., VI.18.10, C. W. Hooker Collector; Bayfld., Wis., Wickham; Beaver Dam, Wis., V.26.1912, W. E. Snyder.

Iowa:

Burlington, Iowa, July 18, 1925, H. M. Harris, on carrot; Burlington, Ia., 17.7.25, C. J. Drake, injuring carrots; Iowa City, Wickham; Ames, Iowa, 9 June, 1924; Spirit L., Ia., J. H. B.; Lake Okoboji, Ia., 7-3-'16 and VI-27-'16, L. Buchanan; Lake Okoboji, Ia., June 26, 1917 and July 10, 1917, L. L. Buchanan; Lake Okoboji, Ia., VII-4-'16, Briggs; Lake Okoboji, Ia., VII-1-'16, Stoner; Ames, Iowa, V-27-'13, D. Stoner; Iowa, Bufo 2052; Milford, Ia., Bufo am. 1997.

Kansas:

Topeka, Ks., Popenoe; Ks., 4.15.73; Topeka, Kans., Je., Popenoe; Topeka, Kans.; Kans.; Lawrence, Kansas, 5-24-33, L. S. Henderson, trap light; Lawrence, Kansas, 5-17-34, L. S. Henderson, At light; Lawrence, Kansas, 7-11-33, M. W. Sanderson, At Light; Doug. Co., Ks., 5-26-34, C. M. Amyx.

Missouri:

vic'y., St. Joseph, Missouri, Feeding on Carrot; Webster Groves, Mo., 6.18.20, Reared from lv. in Carrot, Issued VII.1.20, Webster Grvs. No. 20549, Satterthwait Collector; Onyx, Mo., IX.

Oklahoma:

Delaware Co., Okla., July 11, 1931, Costher & Davis.

North Dakota:

Mooreton, N. Dak., VII-24; University, N. D., June 15,'96, R. P. Currie Collector.

South Dakota:

Brookings, S. D.

Montana:

Poplar, Mont., July 13, 1922, C. C. Sperry Collector, Electric Light.

Idaho:

Coer d'Alene, Idaho, June, Wickham.

Oregon:

Portland, Oreg.

CANADA

Quebec:

St. Hilaire, Que., VI.34, G. Chagnon; Berthierville, P. Q., VI-30-21; Mt. St. Hilaire, Que., VI.09.

Ontario:

E. Ont.; Belleville, Ont., Can.; Trenton, Ont. Can., 25.6.01, Evans, at light; Trenton, Ont. Can., 22.VI.08, Evans.

Manitoba:

Aweme, Manitoba, VI.18.09 and VI.23.12, Criddle; Winnipeg, Man.; Husavick, Manitoba, VI.23.12, N. Criddle; Darlinglord, Man., 3.VIII.1923. N. Criddle.

Listronotus oregonensis (LeConte)

subspecies *tessellatus* Casey 1895

1895. *Listronotus tessellatus* Casey, Coleop. Notices VI, Ann. N. Y. Ac. Sci., VIII, p. 828.

1920. *Listronotus tessellatus* Casey. Leng, Catalogue of the Coleoptera of America, North of Mexico, p. 316.

1931. *Listronotus tessellatus* Casey. Schenkling and Marshall, *in* Junk, Coleopterorum Catalogus, Subfam. Cylindrorrhininae, Pars 114, p. 13.

ORIGINAL DESCRIPTION. "Elongate-oval, strongly convex, black, the tibiae, tarsi, and antennae rufo-piceous; scales very dense, rounded and with radiating strigosity, only slightly larger on the pronotum but more distinct, cinereous-white in color with two large transverse areas of black at the base of the pronotum and two smaller and feebler at the middle, the elytra with numerous isolated or partially anastomosing black spots throughout the extent; head densely, the beak more sparsely clothed with short, narrow squamules. Head three-fifths as wide as the prothorax, without a fovea but with a rounded spot of pale scales between the eyes, the latter remotely separated; beak short and stout, not as long as the prothorax, bent downward and feebly dilated toward tip, finely, densely, rugosely punctate, with a single fine and feeble dorsal carinula; antennae rather short and thick, inserted at outer third or fourth, the second funicular joint not quite twice as long as the first and but slightly longer than the next three, the third longer than the fourth. Prothorax small, slightly wider than long, the sides arcuate; apex truncate, more than three-fourths as wide as the base, which is but feebly arcuate-truncate; ocular lobes moderately developed; disk evenly convex, finely, sparsely punctate, each puncture with a small

suberect stout hair. Scutellum small, not conspicuous. Elytra one-half longer than wide, scarcely three times as long as the prothorax and one-half to nearly two-thirds wider, parallel and straight at the sides, gradually obtusely rounded behind, humeri rounded to the prothorax, exposed at base; subapical umbones obsolete; disk finely striate, the striae very finely, scarcely distinctly punctate, the intervals feebly convex, finely, sparsely punctate, each puncture bearing a stout erect and strigilate hair. Abdomen thinly clothed with short, stout hairs, squamose toward the sides, strongly and closely punctate; legs moderately long, the femora more densely squamose and swollen distally but narrowed near the tip; hairs short, erect and sparse. Length, 5.3-6.5 mm.; width, 2.25-2.85 mm.

"Colorado (Denver). Mr. Hugo Soltau.

"A small but distinct species, quite conspicuous in maculation; it was taken by Mr. Soltau in considerable numbers. It may be placed near *rotundicollis* in the arrangement recently proposed by LeConte (Proc. Am. Phil. Soc., XV, p. 128)."

ADDITIONAL DESCRIPTION. *Length,* 5 to 7 mm. The relative amount of the light and dark scales varies to a considerable extent. Some examples are found in which the light scales on the prothorax form a narrow median vitta and broader lateral markings, with the greater part of the disk covered by two broad, longitudinal bands of black scales. Other specimens have been seen which had the entire prothorax covered with light scales, with the exception of a very small patch of dark scales on each side of the middle at the base. All degrees of development of the dark bands have been observed between the two conditions represented by the extremes which have been described. The darker forms are predominant, and the obliteration of the dark bands begins at the apex of the prothorax and progresses toward the base. *Beak* with a median carina which may sometimes be very prominent and sharp; lateral carinae sometimes slightly evident; equal in length to the prothorax. *Head* very densely, coarsely, and rugosely punctate; frontal fovea rather deep, and covered with a small spot of rounded light-colored scales which contrast strongly with the shining black surface of the beak and the slender setae of the head and beak. Third segment of funicle of *antennae* only very slightly, if any, longer than the fourth. *Prothorax* one-fifth to one-fourth wider than long; sides usually rather strongly rounded, slightly constricted at apex, broader at base than apex; disk convex, often with a feeble median sulcus, and usually slightly constricted just before the apex; disk thickly clothed with

scales which are very slightly larger than those of elytra; surface more finely and densely punctate and granulate than in *L. oregonensis* (LeConte). *Male* with all of median portion of third abdominal sternum and basal part of fourth sternum concave. *Female* with third and fourth sterna flat; seventh sternum unmodified.

NOTES ON TYPES. The type of *L. tessellatus* Casey has been examined. It is a female labeled "Denv., Col." and is located in the Casey collection in the United States National Museum. There are also six paratypes which bear the same label. There is another specimen labeled "Cheyenne, Wyo., 4/19.89," which has been determined by Casey as *tessellatus*.

REMARKS AND COMPARATIVE NOTES. *L. tessellatus* Casey is treated here as a subspecies of *L. oregonensis* (LeConte). The subspecies differs from the species mainly in the color of the body and scales. The body is nearly black and the scales lack all cupreous tinge, being either black or dirty white. The beak is a little stouter and more convex on the upper surface, giving it the appearance of being bent downward at the tip. The median carina of the beak is more prominent and the basal portion of the beak and the front of the head are more densely, deeply, and rugosely punctate than in *L. oregonensis* (LeConte). The eighth sternum of the female and the genitalia of the male are the same in the subspecies as in the species.

DATA ON DISTRIBUTION. This subspecies has a very interesting distribution. I have seen specimens from six localities, extending from Denver, Colorado, to Medicine Hat, Alberta. These six points are all just east of the continental divide, and a line drawn through these points curves westward as it extends north, the curve corresponding almost exactly to that of the continental divide. Specimens have been examined as follows:

UNITED STATES

Colorado:

Denver, Col., 8.4.93; Denver, Colo., 7/4; Denver, Col., 10.6, 2/10, 6.10 and 23/10.

Wyoming:

Cheyenne, Wyo., 4/19.89 and 20.4.89; Sheridan, Wyo., IX; Platte Co., Wyoming, Chugwater, El. 6,100 ft., VII-25-1926, Huntington.

Montana:

Assinbne., Mont., 24.8.

CANADA

Alberta:

Medicine Hat, Alta., III.25.1923 and III-29-28, F. S. Carr; Medicine Hat, Alberta, Canada, III-4-1925, F. S. Carr.

Listronotus elegans Van Dyke 1929

(Plate XXXVII, fig. 10)

1929. *Listronotus elegans* Van Dyke, Pan-Pacific Entomologist, V., p. 107.
1931. *Listronotus elegans* Van Dyke. Schenkling and Marshall, *in* Junk, Coleopterorum Catalogus, Subfam. Cylindrorrhininae, Pars 114, p. 11.
1933. *Listronotus elegans* Van Dyke. Leng and Mutchler, Second Supplement to Catalogue of Coleoptera of America, North of Mexico, p. 49.

ORIGINAL DESCRIPTION. "Elongate, subparallel; piceous, upper part of head, prothorax and elytra densely clothed with metallic scales, the underside of head, afterbody and legs less densely covered, scales of the base of head, pronotum and elytra golden brown except for two linear patches at the side of pronotum posteriorly, and most of the fourth, fifth and sixth elytral intervals, which are silvery green, the scales of beak, legs and underside of body greenish. Beak robust, moderately convex above, nonsulcate and without carinae except at times a faint median one near apex, a well marked though small fovea on the front between the eyes, the scales of head slightly elongate; antennae with the funicle moderately slender, the third and following segments rounded, subequal, second one and a half times as long as first. Prothorax barely broader than long, ocular lobes but moderately prominent, sides arcuate, slightly constricted near apex, disk densely and coarsely though shallowly punctured, in fresh specimens entirely concealed by the scales, the scales but very little larger than those of the elytra. Elytra less than twice as long as broad, broadly emarginate at base, sides parallel from rounded humeri to apical fourth, thence broadly rounded to suture; striae and strial punctures fine; intervals wide and flat; setae fine and short, though conspicuous especially on apical declivity. Length, including beak, 6.5 mm.; breadth, 2.5 mm.

"Holotype (No. 2508 Mus. Calif. Acad. Sci.) and one paratype in my collection, taken near Sobre Vista, Sonoma county, California, May 8, 1910, and April 30, 1910, by Mr. J. August Kusche.

"This very attractive species, like the preceding, belongs in LeConte's second group and should be placed somewhere near *Listronotus teretirostris* Lec., the smaller specimens of which it equals in size and also resembles in its robustness and general parallel form. It differs from this in coloration, in lacking the evident rostral carinae, in having a broader prothorax, the elytral apices more suddenly and broadly rounded and the elytral striae and strial punctures finer. I believe that there is no marked difference between the sexes."

ADDITIONAL DESCRIPTION. *Length,* 5.7 mm. *Beak* about the same length as the prothorax. *Prothorax* finely granulate-punctuate; scales of disk narrower than those on sides. *Ventral surface* very

finely and densely punctate; thickly clothed with setae. *Female* with third abdominal sternum slightly concave in median portion of posterior half; seventh sternum unmodified.

NOTES ON TYPES. The paratype of *L. elegans* Van Dyke has been examined. It is a female collected at Sobre Vista, Sonoma county, Cal., April 30, 1910, and was loaned to me from the collection of the author. The holotype is in the Museum of the California Academy of Science.

REMARKS AND COMPARATIVE NOTES. The single female paratype is the only specimen of this very distinct species which I have seen.

DATA ON DISTRIBUTION. Known only from California.

Listronotus nebulosus LeConte 1876

(Plate XXXII, fig. 4; Plate XXXVII, fig. 8)

1876. *Listrontous nebulosus* LeConte, Proc. Am. Phil. Soc., Vol. XV, p. 133.
1876. *Listronotus sulcirostris* LeConte, Proc. Am. Phil. Soc., Vol. XV, p. 132.
1877. *Listronotus nebulosus* LeConte. Popenoe, Trans. Kan. Acad. Sci., Vol. V, p. 39.
1878. *Listronotus nebulosus* LeConte. Popenoe, Trans. Kan. Acad. Sci., Vol. VI, p. 85.
1885. *Listronotus nebulosus* LeConte. Townsend, Can. Ent., Vol. XVII, p. 72.
1893. *Listronotus nebulosus* LeConte. Beutenmüller, Jr. N. Y. Ent. Soc., Vol. 1, p. 40.
1903. *Listronotus nebulosus* LeConte. Ulke. Proc. U. S. N. M., XXV, p. 33.
1906. *Listronotus sulcirostris* LeConte. Evans, Can. Ent., Vol. XXXVIII, p. 100. (Name probably cited in error.)
1910. *Listronotus nebulosus* LeConte. Smith, Insects of New Jersey, p. 382.
1916. *Listronotus nebulosus* LeConte. Blatchley and Leng, Rhynchophora of North Eastern America, p. 159.
1916. *Listronotus sulcirostris* LeConte. Blatchley and Leng, Rhynchophora of North Eastern America, p. 158. (Probably refers to *L. frontalis* Lec.)
1920. *Listronotus nebulosus* LeConte. Leng, Catalogue of the Coleoptera of America, North of Mexico. p. 317.
1920. *Listronotus sulcirostris* LeConte. Leng, Catalogue of the Coleoptera of America, North of Mexico, p. 317.
1931. *Listronotus nebulosus* LeConte. Schenkling and Marshall, *in* Junk, Coleopterorum Catalogus, Subfam. Cylindrorrhininae, Pars 114, p. 12.
1931. *Listronotus sulcirostris* LeConte. Schenkling and Marshall, *in* Junk, Coleopterorum Catalogue, Subfam Cylindrorrhininae, Pars. 114, p. 12.
1937. *Listronotus nebulosus* LeConte. Bleasdell, Iowa St. Coll. Jr. Sci., Vol. XI, No. 4, p. 416.

ORIGINAL DESCRIPTION. "Elongate, blackish, clothed with scales, mottled brown and dark, on the head with a metallic lustre. Beak feebly carinate and sulcate as usual. Prothorax longer than wide, sides feebly rounded for two-thirds the length, then more rounded to the tip; scales small, a bifurcated lateral vitta, and an interrupted dorsal line paler; punctures dense and deep. Elytra about one-fourth wider than the prothorax, strongly emarginate at base, humeri oblique, slightly rounded; striae strongly punctured, interspaces wide and flat. Thighs with a pale band. Length, 9.5 mm.; .375 inch.

"Female. Last ventral slightly impressed; elytra conjointly rounded at tip.

"One female, Missouri. Easily recognized by the elongate form and mottled color."

ADDITIONAL DESCRIPTION. *Length*, 6.5 to 9 mm. *Beak* stout, thick, slightly curved on upper side; slightly shorter than prothorax; a little shorter and thicker in the male than in the female; usually with a very sharp, smooth median carina; lateral carinae sometimes rather prominent; upper surface densely rugulosely punctate, clothed with a few narrow scales and slender setae. *Antennae* stout; second segment of funicle about one-half longer than first; third segment of funicle nearly rounded, not elongate. *Head* convex, densely punctate, clothed with slender setae; frontal fovea usually rather deep, with a small patch of rounded scales. *Prothorax* as wide as long, not longer than wide, as is stated in the original description; ocular lobes moderately developed; sides broadly rounded, widest at middle, slightly wider at base than at apex; disk densely punctate; a number of scattered punctures are much larger and deeper, and bear short, slender setae instead of rounded scales as do the other punctures. *Legs* stout. *Ventral surface* moderately punctate, large and small punctures intermixed; sparsely clothed with small scales, except median part of seventh abdominal sternum. *Male* with basal portion of third abdominal sternum slightly depressed; seventh sternum slightly convex, more densely and finely punctate than the other sterna. *Female* with seventh sternum very densely and finely, slightly rugulosely punctate; a transverse concave preapical area.

NOTES ON SYNONYMY. An examination of LeConte's types shows that *L. nebulosus* LeConte and *L. sulcirostris* LeConte are both the same species. Both species were described in 1876 in the same paper, but *L. sulcirostris* LeConte appears on page 132 and *L. nebulosus* LeConte on page 133, giving the former name page priority. *L. nebulosus* LeConte, however, is the name which is in common usuage. The type specimen is also more typical of the species than are the two types of *L. sulcirostris* LeConte, which are abraded and represent extremes of variation found within the species. For these reasons the matter of page preference is being disregarded; *L. nebulosus* LeConte is retained as the name of the species, and *L. sulcirostris* is made the synonym.

NOTES ON TYPES. The type of *L. nebulosus* LeConte bears a yellow disk indicating the "western states," and the original description gives Missouri as the locality. The specimen is a female, and is very typical of the species.

The types of *L. sulcirostris* LeConte, a female and a male, bear

orange disks indicating the "southern states," Georgia being the locality given in the original description. These specimens have the lateral carinae of the beak rather prominent, but an examination of a number of specimens of *L. nebulosus* LeConte will show that this is not an uncommon variation within the species. The female type of *L. sulcirostris* LeConte has the seventh sternum of the abdomen more strongly impressed than the average condition found in the species.

The types of *L. nebulosus* LeConte and *L. sulcirostris* LeConte are in the LeConte collection in the Museum of Comparative Zoölogy at Harvard College.

BIOLOGICAL NOTES. Popenoe (1878) stated that this species occurred at Topeka, Kan., with *L. caudatus* (Say) on Sagittaria. This record is probably based on a misdetermination, for I have seen a male specimen of *L. caudatus* (Say) from Topeka, Kan., which had been determined by LeConte as *L. nebulosus* LeConte. Since the species actually does occur in this locality, the erroneous record of locality is inconsequential, but we must regard as questionable the record of the occurrence of *L. nebulosus* LeConte on Sagittaria.

Townsend (1885) records the species as being quite numerous in Louisiana with *L. tuberosus* LeConte, *L. callosus* LeConte, and *L. frontalis* LeConte, beneath old railroad ties on the ground and under pieces of wood in dry places during the first part of April.

The species was found hibernating under a pecan log in Victoria county, Texas, on February 3, by J. B. Mitchell.

L. nebulosus LeConte is frequently taken at light.

DATA ON DISTRIBUTION. The range of this species seems to be limited mostly to the central states, extending from Texas and Louisiana, northward to Indiana, Illinois, and Wisconsin. I have examined specimens from the following localities:

Louisiana:

La.; New Orleans, La., 14/3, 6/6, 10/6, 18/10; Gueydan, La., May 29, June 14, and July 11, 1925. E. Kalmbach, at light.

Indiana:

Ind.; Lake Co., Ind., 7-27-97, W. S. B.

Illinois:

Ill.

Wisconsin:

Wisc.

Iowa:

Iowa City, Iowa, E. J. Bashe Collector; Iowa City, Wickham.

Nebraska:

Neb. City, Nebraska, Shimek.

Kansas:

Ks.; Kan.; Kans.; Topeka, Kansas, July 8; Douglas Co., Kans., F. H. Snow; Kan., T. B. A.; Lawrence, Kansas, 7-21-33, M. W. Sanderson, at light.

Missouri:

Mo.

Oklahoma:

Okmulgee, I. T., Je.24, J. D. Mitchell Collector, at light.

Texas:

Tex.; Calletto cr. bottom, Victoria Co., Tex., 11-3-12, J. D. Mitchell Collector, hibernating under pecan log; Gregory, Tex., June 8, '04, at light; Brownsville, Tex., Nov. 21-1910, at light; Waco, Tex., Bufo. No. 2080.

Listronotus similis new species

(Plate XXXVI, fig. 1)

Length, 6 to 10 mm. Elongate-oblong. Black to piceous. Covered with dark brown and light scales, the light ones sometimes with a faint pearly lustre; scales somewhat larger on the prothorax and slightly imbricated on the elytra; arrangement of the light scales variable but usually with indistinct lateral vittae on the prothorax and a humeral spot on the elytra, with varied amounts of pale scales scattered over the elytra. *Beak* short, stout, shorter than the prothorax; median carina strongly elevated, smooth, shining; punctuation coarse and deep. *Antennae* stout, thicker than in any of the closely related species; second segment of funicle about one-half longer than the first, third segment rounded, fourth to seventh segments stout, the outer segments slightly transverse. *Head* densely punctate, more coarsely so between the eyes, each puncture bearing a small seta; frontal fovea deep, covered with a small patch of large, light-colored scales. *Prothorax* slightly wider than long; ocular lobes moderately developed; sides of prothorax evenly and rather strongly rounded; disk coarsely and rather densely punctate, each puncture just covered by a scale, a few scattered punctures larger and bearing short, slender setae instead of scales. *Scutellum* slightly elongate, densely covered with tiny light-colored setae. *Elytra* rather deeply emarginate at base; humeri right-angulate; sides gradually narrowed from the base to the apical fourth, then strongly curved to the conjointly rounded apices; striae only very slightly impressed, the punctures moderately coarse and not deep; intervals nearly flat, smooth, the setae inconspicuous on the disk, longer and stouter on the declivity; subapical umbones obsolete. *Legs* stout, especially the femora, which are strongly clavate; tibiae slightly enlarged at apex; apical mucrones of tibiae moderately long, those on the front tibiae of both sexes with a small acute tooth at the

base; hind tibiae, especially of the male, with a rather dense brush of yellowish hairs along the inner margin of the apical half. *Male* with the third (first visible) abdominal sternum slightly concave at the middle; third and fourth (first and second visible) abdominal sterna coarsely punctate, most of the punctures bearing large scales, a few punctures on the sides, more on the median part of the sclerites, bearing very slender scales or setae; fifth to seventh (third to fifth visible) sterna very finely and densely punctate, clothed only with short slender setae; seventh sternum strongly convex. *Female* with third (first visible) abdominal sternum very slightly convex at the middle; all of the abdominal sterna with broad scales only at the middle; seventh (fifth visible) sternum with punctures smaller and more closely placed, very finely and densely punctate at the extreme apex; seventh sternum with a distinct transverse subapical impression.

Notes on Types. Holotype male and allotype female, "Brownsv'le, Tex., VI, 11-16, '33, Darlington." Eight paratypes as follows: 3 males, "Brownsv'le, Tex., VI, 11-16, '33, Darlington"; 1 male, "Brownsville, Tex., VI-25-08"; 1 male, "Kingsville, Texas, C. T. Reed"; 1 male, "Dickinson, Tex., 5-20, 1935"; 2 males, "So. Texas, May, 1910."

Holotype and allotype in the Museum of Comparative Zoölogy at Harvard College. Paratypes in the Museum of Comparative Zoology, the United States National Museum, the Francis Huntington Snow Entomological Collections at the University of Kansas, and in the collections of the Illinois Natural History Survey and at College Station, Texas.

Remarks and Comparative Notes. This species is extremely closely related to *L. nebulosus* LeConte. The internal genitalia of the males of the two species, although quite distinct, are very similar and clearly demonstrate the close relationship. From a study of the allotype, which is the only female of this species that I have seen, it is impossible to distinguish any significant difference in the eighth sterna of the females of the two species. It is possible that with more specimens available some distinguishing characters could be detected.

Because of the difference in the male genitalia the separation of males of *L. similis* n. sp. and *L. nebulosus* LeConte is easily made from dissections. Separation of the two species is not so easy on the basis of external characters. Because of the close relationship and the natural variation within a species, the use of any one character

may not always be sufficient to definitely separate the two species. A combination of characters has been worked out, however, which will serve to separate them. In an examination of the specimens at hand, *L. similis* n. sp. has been found to have a small acute tooth at the base of the apical mucro of the front tibia in both the male and the female. This tooth is absent in *L. nebulosus* LeConte. The prothorax of *L. similis* n. sp. is usually slightly wider than long and has the sides rather strongly rounded. The prothorax has the appearance of being wider and larger than in *L. nebulosus* LeConte, where it has the sides more broadly rounded. In *L. nebulosus* LeConte the prothorax is as long as wide, or sometimes slightly longer than wide. In *L. similis* n. sp. the width of the beak at the point of insertion of the antennae is more than nine-tenths of the width of the interocular space directly across the center of the frontal fovea. The beaks of the males are usually wider than those of the females, and in some males the two measurements just described have been equal. In *L. nebulosus* LeConte the width of the beak at the point of insertion of the antennae is usually less than nine-tenths of the width of the interocular space across the center of the frontal fovea. In comparing the two species *L. similis* n. sp. appears to have stouter antennae, as well as shorter, heavier legs, with more strongly clavate femora.

DATA ON DISTRIBUTION. Known only from the southern part of Texas, usually along the coastal region.

Listronotus appendiculatus (Boheman) 1842

(Plate XXXIII, fig. 2; Plate XXXVI, fig. 3)

1842. *Listroderes appendiculatus* Boheman, *in* Schönherr, Genera et Species Curculionidum, VI, 2, p. 192.

1853. *Listroderes appendiculatus* Schönherr. Melsheimer, Catalogue of the described Coleoptera of the United States, p. 95.

1871. *Listroderes appendiculatus* Boheman. Gemminger and Harold, Catalogus Coleopterorum, VIII, p. 2359.

1873. *Listroderes appendiculatus* Boheman. Crotch, Check List of the Coleoptera of America, North of Mexico, p. 118.

1876. *Listronotus appendiculatus* (Boheman). LeConte, Proc. Am. Phil. Soc., Vol. XV, p. 132.

1881. *Listronotus appendiculatus* (Boheman). Snow, Trans. Kan. Aca. Sci., Vol. VII, p. 79.

1890. *Listronotus appendiculatus* (Boheman). Beutenmüller, Can. Ent., Vol. XXII, p. 200.

1893. *Listronotus appendiculatus* (Boheman). Beutenmüller, Jr. N. Y. Ent. Soc., Vol. I, p. 40.

1894. *Listronotus appendiculatus* (Boheman). Webster, Ohio Agric. Exp. Sta. Bull., No. 58, p. 29, fig.

1894. *Listronotus appendiculatus* (Boheman). Webster, The Ohio Farmer, p. 97, 1 fig.

1894. *Listronotus appendiculatus* (Boheman). Webster, Insect Life, Vol. VII, p. 206.

1895. *Listronotus appendiculatus* (Boheman). Hamilton, Trans. Am. Ent. Soc., XXII, p. 344.

1903. *Listronotus appendiculatus* (Boheman). Ulke, Proc. U. S. N. M., XXV, p. 33.

1910. *Listronotus appendiculatus* (Boheman). Smith, Insects of New Jersey, p. 382.

1916. *Listronotus appendiculatus* (Boheman). Blatchley and Leng, Rhynchophora of North Eastern America, p. 160.

1916. *Listronotus floridensis* Blatchley, *in* Blatchley and Leng, Rhynchophora of North Eastern America, p. 160.

1919. *Listronotus floridensis* Blatchley. Blatchley, Can. Ent. Vol. LI, p. 68.

1920. *Listronotus floridensis* Blatchley. Blatchley, Jr. N. Y. Ent. Soc., Vol. XXVIII, p. 163.

1920. *Listronotus appendiculatus* (Boheman). Leng, Catalogue of the Coleoptera of America, North of Mexico, p. 316.

1920. *Listronotus floridensis* Blatchley. Leng, Catalogue of the Coleoptera of America, North of Mexico, p. 317.

1925. *Listronotus appendiculatus* (Boheman). Blatchley, Jr. N. Y. Ent. Soc., Vol. XXXIII, p. 92.

1926. *Listronotus leucozonatus* Chittenden, Jr. N. Y. Ent. Soc., Vol. XXXIV, p. 92.

1928. *Listronotus leucozonatus* Chittenden. Blatchley, Jr. N. Y. Ent. Soc., XXXVI, p. 241.

1928. *Listronotus floridensis* Blatchley. Blatchley, Jr. N. Y. Ent. Soc., XXXVI, p. 242.

1928. *Listronotus appendiculatus* (Boheman). Leng, Cornell Univ. Agri. Exp. Sta., Memoir 101, p. 495.

1929. *Listronotus impressus* Van Dyke, Pan-Pacific Entomologist, V, p. 106.

1931. *Listronotus appendiculatus* (Boheman). Schenkling and Marshall, *in* Junk, Coleopterorum Catalogus, Subfam. Cylindrorrhininae, Pars 114, p. 11.

1931. *Listronotus floridensis* Blatchley. Schenkling and Marshall, *in* Junk, Coleopterorum Catalogus, Subfam. Cylindrorrhininae, Pars 114, p. 11.

1931. *Listronotus leucozonatus* Chittenden. Schenkling and Marshall, *in* Junk, Coleopterorum Catalogus, Subfam. Cylindrorrhininae, Pars 114, p. 12.

1931. *Listronotus impressus* Van Dyke. Schenkling and Marshall, *in* Junk, Coleopterorum Catalogus, Subfam. Cylindrorrhininae, Pars 114, p. 11.

1933. *Listronotus leucozonatus* Chittenden. Leng and Mutchler, Second Supplement to Catalogue of the Coleoptera of America, North of Mexico, p. 49.

1937. *Listronotus appendiculatus* (Boheman). Bleasdell, Ia. St. Coll. Jr. Sci., Vol. XI, No. 4, p. 416.

ORIGINAL DESCRIPTION. "Oblongus, piceus, dense griseosquamosus, antennis pedibusque ferrugineis, rostro crassiusculo, medio obsolete uni-carinato; thorace confertim punctulato; elytris obsolete punctato-striatis, interstitiis sub-setosis, apice spina incurva auctis.

"Patria: Pensylvania orientalis. A Dom. Zimmermann Benevole communicatus. Mus. Schh.

"Magnitudo *Phytonomi suspiciosi*. Caput rotundatum, convexum, confertim punctulatum, piceum, squamulis parvis, rotundatis, fusco-cupreis vestitum; oculi laterales, oblongi, nigri, haud prominuli; rostrum thorace vix longius, validum, parum arcuatum, confertim punctulatum, in medio obsolete et tenue carinatum, indumento capitis. Antennae ad apicem rostri insertae, longiusculae, ferrugineo-piceae, parce pilosae, clava ovata, acuminata. Thorax latitudine media longior, apice late et profunde emarginatus, lobis ocularibus valde productis, obtuse rotundatis intra apicem leviter constrictus et transversim impressus, lateribus nonnihil rotundato-ampliatus, basi parum profunde bi-sinuatus, supra modice convexus, confertim punctatus, dorso carinula antice posticeque abbreviata, valde obsoleta instructus; obscure ferrugineus, dorso parcius lateribus et subtus squamositate densa, grisea, tectus. Scutellum rotundatum,

griseo-squamosum. Elytra oblonga, antice conjunctim leviter emarginata, thoracis basi dimidio latiora, pone basin rotundato-ampliata, humeris parum elevatis, versus apicem attenuata, apice singulatim spina brevi, valida, incurva, aucta, thorace quadruplo longiora, supra modice convexa, obsolete punctato-striata, interstitiis sub-planis; picea, squamositate densa grisea tecta, setulisque brevibus adspersa; intra apicem singuli elytri callus parum elevatus observatur. Pygidium occultatum. Corpus subtus confertim punctatum, piceo-ferrugineum, squamulis sub-cupreo-micantibus parce adspersum, segmentum anale ventris apice truncatum. Pedes mediocres, validi, ferruginei, parce cinereo-squamulosi; femoribus clavatis, muticis; tibiis teretibus, sub-rectis; tarsis modice dilatatis, subtus brunneo-spongiosis.—Bhn."

ADDITIONAL DESCRIPTION. *Length*, 4.2 to 7 mm. Elongate-oblong. Color reddish-brown, elytra usually with small, black markings near the middle on the second and third intervals, sometimes extending obliquely forward to the humeri. Rather thinly clothed with small testaceous scales which may become imbricated on the posterior half of the elytra. A narrow median and a broader irregular sublateral vitta on the disk of the prothorax of lighter scales. Posterior third of elytra often thickly clothed with the same lighter scales, or sometimes the lighter marking confined to a spot at the beginning of the declivity between the third or fourth intervals, the declivity being covered with darker scales. *Beak* moderately thick, slightly curved on upper surface; slightly longer than prothorax; median carina fine, sometimes obsolete except at apex; sometimes with portion of beak between lateral carinae slightly concave to point of insertion of antennae; upper surface finely punctate, thinly clothed with very narrow scales. *Head* convex, densely punctate, clothed with very narrow scales; frontal fovea distinct. *Antennae* moderately stout; second segment of funicle nearly twice as long as first; third to seventh segments rounded. *Prothorax* slightly wider than long; ocular lobes prominent; sides slightly rounded, somewhat constricted at apex; disk densely and moderately coarsely punctate; scales larger than those of elytra, with a few narrow scales intermixed; disk sometimes with a fine median carina which may, however, sometimes be rather prominent; this carina abbreviated at base and apex. *Scutellum* slightly elongate. *Elytra* slightly arcuate at base; humeri rounded; striae fine, their punctures coarse and close-set; first two intervals depressed around scutellum, the strial punctures very coarse in this region; intervals flat or very slightly convex; setae very short, not

conspicuous. *Ventral surface* with metathoracic sternum and third and fourth abdominal sterna usually black or rufo-piceus; densely, moderately punctate; partially clothed with slender setae except for a few rounded scales on the sides of the metathoracic sternum and third and fourth abdominal sterna. *Male* with third and fourth abdominal sterna broadly concave at middle; elytra conjointly rounded. *Female* with third and fourth abdominal sterna convex; seventh sternum unmodified; tips of elytra normally prolonged into short, slender, parallel, cylindrical processes. The processes of the elytra are variable in their extent of development, sometimes being very short and occasionally entirely absent.

NOTES ON SYNONYMY. This species has a wide distribution and displays a great deal of variation. Several synonyms have been created as a result of this variation. *Listronotus floridensis* Blatchley, *Listronotus leucozonatus* Chittenden, and *Listronotus impressus* Van Dyke are now to be considered as synonyms of *Listronotus appendiculatus* (Boheman). Type material of all these names has been studied. The conclusions in regard to synonymy have been formed only after careful examination of the types and long series of specimens. A very few individuals can be segregated into what might appear at first to be different species. By studying additional specimens, however, intermediate forms are found, and it is impossible to find any character or set of characters which will serve to separate even the majority of the specimens into groups.

NOTES ON TYPES. The type of *L. appendiculatus* (Boheman) is in the museum at Stockholm, Sweden, and has been exanimed. It is a female and was collected in Pennsylvania.

The type specimen and type series of *L. floridensis* Blatchley have been examined. These specimens are in the Blatchley collection at Purdue University.

The type and several paratypes of *L. leucozonatos* Chittenden have been examined. These specimens are in the United States National Museum.

Through the kindness of Dr. E. C. Van Dyke I have been supplied with a female paratype of *L. impressus* Van Dyke, which is to be deposited in the Francis Huntington Snow Entomological Collections at the University of Kansas. Another female paratype has been examined in the United States National Museum. The type and other paratypes are in the Museum of the California Academy of Science.

REMARKS AND COMPARATIVE NOTES. An indication of the amount of variation found within this species has already been given. The

variation in the tips of the female elytra is comparable to the situation found in *L. squamiger* (Say), except that there the elytra are usually rounded, while in *L. appendiculatus* (Boheman) they are usually prolonged into short processes.

There is also some variation in the amount of black found on the elytra and on the ventral surface. A series of specimens from Creston, British Columbia, has a great deal of black marking on the body. One specimen has the black fascia of the disk of the elytra extending laterally to the sixth intervals; has a black bar along the median third of the elytra on the seventh and eighth intervals; and has the greater part of the abdominal sterna black.

BIOLOGICAL NOTES. Beutenmüller (1890 and 1893) gives the following note concerning this species; "Mr. F. M. Chittenden found *L. tuberosus, L. caudatus* and *L. appendiculatus* while sweeping a small patch of aquatic plants composed entirely of *Sagittaria* and a species of *Carex*. *L. appendiculatus*, it is said, was found by Mr. William Julich breeding in the lower parts of the stems of some species of reed." Webster (1894) recorded it as attacking cabbage in Ohio, gouging out cavities in the stems of young plants and later attacking the bases of the larger leaves. Smith (1910) records this species from New Jersey, stating that it was commonly taken in winter by sifting. Blatchley (1919), using the name *L. floridensis* Blatchley, records the species as having been taken in numbers on March 2, from flowers of *Sagittaria*. Blatchley (1928), again using the name *L. floridensis* Blatchley, says, "This has proved to be a common species throughout southern Florida, scores having been taken at Royal Palm Park in April on flowers of arrowhead along the margins of the everglades." The specimens described by Van Dyke (1929) were taken from rice paddies in California.

The species has been taken in August at Waldoboro, Maine, on *Sagittaria latifolia*. It was bred from Sagittaria by Criddle at Treesbank, Manitoba. At Creston, British Columbia, it was taken on *Sagittaria arifolia* and on flood debris, the altitude being given as 1,750 feet. It was taken on *Chelone glabra* by D. H. Blake at Stoughton, Mass. It was taken on Nelumbo in Texas on May 17, 1906, by F. C. Pratt, and had been determined by W. D. Pierce as *L. latiusculus* (Boh.). Darlington found it in late March at Arlington, Massachusetts, in moss roots. It has been taken in Louisiana and the District of Columbia at light.

DATA ON DISTRIBUTION. *L. appendiculatus* (Boheman) has a wide distribution, being found in Canada from Quebec to British

Columbia and in the United States throughout all the eastern and central, and part of the western states. The lack of records from the western states may be due to lack of material from that region rather than the absence of the species, since it has been seen from Wyoming, British Columbia, and California. Specimens examined were as follows:

UNITED STATES

Maine:

Portland, Me., IX-'02; Portland, Me., IX-17-25; Waldoboro, Me., Aug., on flws. of *Sagittaria latifolia.*

New Hampshire:

Rumney, N. H., 18-VII-1930, Quirsfeld.

Massachusetts:

Mass.; Dorchester, Mass., Jul. 9, 1903, Jul. 11, 1903, Jul. 25, 1903; Brookline, Mass.; Chicopee, Mass., July 13, '96 and July 22, '96; Stoughton, Mass., D. H. Blake, Collected on *Chelone glabra;* Berlin, Mass., VIII-4-1935, C. A. Frost; Tyngsboro, Ms.; Low., Mass.; Northfield, Mass., Aug. 30.98; Arlington, Mass., III-26-26, Darlington, moss roots.

Connecticut:

Hamden, Ct., 25 Sept. 1921, B. H. Walden.

New York:

N. Y.; New York, N. Y.; N. Y. City & vcty.; Warren Co., N. Y., 8.8.91; Ithaca, N. Y.; Ithaca, N. Y., Chittenden Collector; Ithaca, N. Y., July 1/84; Ithaca, N. Y., 24 Mar. 97; Ithaca, N. Y., 27 July, '94; Wash. Co., N. Y.; Staten Is., N. Y., 8/23/13, on *Sagittaria.*

New Jersey:

N. J.; Newark, N. J., VII.4; Irvington, N. J., III-15, XI-7; Camden, N. J., III-3, XI-23 and 12-12; Slt. Mdows., N. J.; Milburn, N. J.; "Upper" Montclair, N. J., VI.4.1922, A. Nicolay Collector; Mchtville., N. J., 3.11; Elizabeth, N. J., XI.29; Westville, N. J., 11.25, H. A. Wenzel Collector; Gloucest. Co., N. J., IV.24, H. W. Wenzel Collector.

Pennsylvania:

Allegheny, Pa.; Greentown, Pa., 21-VII-1926, Quirsfeld; Pennsylv. orient., Zimmerman.

Maryland:

Md.; Hilld Brdg., Patuxent Riv. Md., June 26, '24, H. S. Barber.

District of Columbia:

D. C.; Washington, D. C. Je.27.06, I. J. Condit Collector; Wash., D. C., VII-12-23, J. R. Greeley, at light; Eastern Branch, Washington, D. C., 25 Oct., '21, H. S. Barber; Washgtn., D. C.; Wash. D. C., 3-3-1923; H. S. Barber; Washington, D. C., VI-20-23, J. R. Greeley Coll., at light; Washington, D. C., 24-7-07, 30-7, W. L. McAtee Collector; Washington, D. C., 27-VI-13, W. L. McAtee Collector, at light.

Virginia:

Va.; Rosslyn, Va.

Georgia:

Ga.; Geo.

Florida:

Fla.; Crescent City, Fla.; Dunedin, Pinnellas Co., Fla., II-27-1925; Kissimmee, Fla.; Lake Kissimmee, Fla., Bufo 1384; L. Kissimmee, Fla., Bufo 1392; Dunedin, Florida, II.19.1926, Blatchley; Dunnedin, Fla., III-16-'25, W. S. B.; Homestead, Fla., June, 1929, Darlington; Bell Glade, Fla., 22-23 March, '27, M. D. Leonard Coll.; Paradise Key, Fla., Mrch. 10-18, E. A. Schwarz; Lake Maggorie, Fla., 4-2-23, E. M. Craighead Collector; Big Bayou, Fla., 3-5-23, E. M. Craighead Collector; Brighton, Fla., Okeechobee, June 16, 1929, Darlington.

Alabama:

Mobile Co., Ala., H. P. Löding.

Louisiana:

La.; N. Orleans, La., 10/6, 12/6; N. Orleans, La., 26.X.91, 30.V.95, and 6.7.95; Gueydan, La., June 20, 1925, June 25, 1925, June 26, 1925, June 28, 1925, July 11, 1925, July 28, 1925, Aug. 3, 1925, Aug. 7, 1925, VI,15-16, '25, VI,25-26, '25, E. Kalmbach, at light; Morgan Cy., La., Wickham; Dundee, L., VII-4-03.

Mississippi:

Gulf View, Miss., 20.III.92.

Ohio:

Ohio.

Indiana:

Marion Co., Indiana, VII-14-1924, Blatchley.

Illinois:

Peoria, Ill., Aug. 11, '95.

Michigan:

Oakland Co., Michigan, VII-15-1928, A. W. Andrews; Monroe, Mich.; Detroit, 23 Jun.; Mich.; Detroit, Mich.; Det., Wint.; Cheboygan Co., Mich., 6.30.1934 and 8.2.1934, H. B. Hungerford; Cheboygan Co., Mich., 7-24-1936, David M. Gates; Douglas Lake, Mich., July, 1919; Berrien Co., Mich., July 26, 1917, A. W. Andrews; Paw Paw Lake, Mich., VII.19.09.

Wisconsin:

Cranmoor, Wood Co., Wis., VI-23-07, C. B. Hardenberg; Trempelean, Wis., July 5, '27, F. M. Uhler; Victory, Wis., July 29, 1927, F. M. Uhler.

Minnesota:

Red Wing, Minn., VII,13-21, '26, F. M. Uhler.

Iowa:

Ia.; Iowa; Sioux City, Ia., 25.III.89; Iowa City, IV.5.00, Wickham; Lake Okoboji, Ia., July 22, 1917, July 23, 1917, and July 24, 1917, L. L. Buchanan; Lansing Ia., Aug. 14, 1927, F. M. Uhler; Iowa, Bufo 2052 (Lost Island Lake, Clay county, Iowa, A. G. Ruthven, July 26, 1918); Milford, Ia., Bufo am. 2002 (July 3, 1920, F. N. Blanchard).

Kansas:

Kan., T. B. A.

Missouri:

St. L., Mo.

Texas:

Tex.; Texas; N. Braunflls. Tx., 17 May, 06, F. C. Pratt Collector, on Nelumbo; S. Diego, Tex., 25.5; Brownsville, Texas.

Wyoming:

Cheyenne, Wyo., 21.IV.89.

California:

Oroville, Cal., VII-12-1926, H. H. Keifer Collector; Williams, Colusa Co., Cal., XI.9.28, Collected from Rice Paddies; Colusa Co., Cal. XI-30-28, Williams, H. H. Keifer Collector, collected from paddy rice.

CANADA

Quebec:

Kazubazua, Que., 18-viii-'31, W. J. Brown.

Ontario:

Ont.: Trenton, Ont., Can., 27.VI.11, Evans; Toronto, Can., V.1, V-30, R. J. Crew; Belleville, Ont., Can.

Manitoba:

Aweme, Manitoba, VII.21.11, E. Criddle, *Sagittaria variabilis;* Treesbank, Man., 16.IX.1925, N. Criddle, Bred from Sagittaria.

British Columbia:

Creston, B. C., 12.VIII.1933, G. Stace Smith, on *Sagittaria arifolia,* 1750 ft.; Creston, B. C., 29.X.1933, 4.XI.1933, and 11.XI.1933, G. Stace Smith, On flood debris, 1750 ft.

Listronotus insignis new species

(Plate XXXII, fig. 1; Plate XXXVII, fig. 3)

Length, 4.5 to 6 mm. Oblong, dark reddish-brown to piceous; rather thinly clothed with dull-brown scales which are larger on the prothorax; with a broad curved transverse band of light yellow-brown scales at the beginning of the declivity of the elytra, the declivous portion of the elytra behind the light marking covered with chocolate-brown to black, shining scales; prothorax with a very narrow median vitta and broad lateral vittae of light-brown scales. *Beak* stout, slightly longer than the prothorax; median carina very prominent, sharp and smooth, becoming obsolete a little beyond the point of insertion of the antennae; lateral carinae usually rather sharp and strongly developed; lateral sulci deep; apical portion finely punctate, basal portion very coarsely and rugosely punctate; clothed only with very short, slender setae. *Head* slightly convex; very coarsely and rugosely punctate; the setae short and slender; frontal fovea large and deep. *Antennae* moderately slender; second segment of funicle one-half longer than the first; third to seventh segments rounded. *Prothorax* one-sixth to one-fifth wider than long; ocular lobes prominent; sides nearly parallel, slightly constricted at apex; disk very coarsely and cribrately punctate, the scales scarcely covering the punctures; some of the punctures bearing short, stout setae. *Scutellum* small, depressed; with a few very small dirty white scales. *Elytra* rather stout; base

broadly emarginate; humeri obtuse, rounded; sides nearly parallel to apical fourth, then narrowed to the conjointly rounded apices; striae not at all impressed, coarsely punctate, the punctures large and quadrate when revealed by the removal of the scales; intervals slightly convex, the first and third sometimes more strongly so; the setae very short and inconspicuous on the basal two-thirds, slightly longer and stouter on the apical third. *Ventral surface* sparsely, very coarsely and deeply punctate; seventh (fifth visible) abdominal sternum more finely and densely punctate; lower surface with only a very few rounded scales on the sides of the metathoracic sternum and the third and fourth (first and second visible) abdominal sterna, mostly with very short inconspicuous setae. *Legs* slender, posterior femora with a preapical band of light scales, sometimes with a yellowish or metallic greenish cast; inner margin of all the tibiae with small, sharp, distinct teeth, apical mucrones rather long and sharp. *Male* with third and fourth (first and second visible) abdominal sterna flat or very slightly concave; seventh (fifth visible) sternum rather broadly and feebly convex through the middle. *Female* with the third (first visible) abdominal sternum slightly convex; seventh (fifth visible) sternum with a feeble sublateral concavity on each side and with a broad convexity at the middle, this convexity marked by a rather deep median triangular depression at the apex; seventh tergum broadly and shallowly emarginate.

NOTES ON TYPES. Holotype male, "Paradise Key, Fla., 23.2 1919, E. A. Schwarz." Allotype female, "Paradise Key, Fla., Feb. 28." Twenty-one paratypes as follows: 1 female, "Paradise Key, Fla., Feb. 21"; 1 male, "Paradise Key, Fla., Feb. 22, 1919, A. Wetmore collector"; 2 females, "Paradise Key, Fla., Mar. 2.19, H. Barber collector"; 1 male, "Paradise Key, Fla., Mar. 9"; 1 male, "Royal Palm Park, Fla., 2-26-29, W. S. B."; 1 male, 1 female, "Fla."; 1 male, "Enterprise, Fla., 16.5, Coll. Hubbard & Schwarz"; 1 female, "Homestead, Fla., Feb. 28, 1918, A. Wetmore collector, at light"; 1 female, "Lake Iamonia, Fla., 5-12-16, W. D. Pierce collector"; 3 males, 6 females, "Lake Kissimmee, Fla., E. A. Mearns"; 1 male, "Kissimmee River, Fla., E. A. Mearns."

Holotype and allotype in the United States National Museum. Paratypes in the United States National Museum, Francis Huntington Snow Entomological Collections at the University of Kansas, and in the collection at Purdue University.

REMARKS AND COMPARATIVE NOTES. This species is closely related to *L. oregonensis* (LeConte), but may be distinguished from it

by the more strongly carinate and sulcate beak, the coarsely and rugosely punctate head, the large cribrate punctures of the disk of the prothorax and the absence of tubercles, the characteristic marking of the apical portion of the elytra, the more coarsely punctate ventral surface, and the modification of the seventh, (fifth visible) abdominal sternum of the female. The eighth sternum of the female and the internal genitalia of the male are quite different in the two species.

BIOLOGICAL NOTES. A number of specimens of this species have been taken from the stomachs of *Bufo terrestris* at Lake Kissimmee, Florida. The species has also been taken at light on February 28, at Homestead, Florida.

DATA ON DISTRIBUTION. Known only from Florida.

Listronotus setosus LeConte 1876

(Plate XXXIII, fig. 3; Plate XXXVI, fig. 7)

1876. *Listronotus setosus* LeConte, Proc. Am. Phil. Soc., XV, p. 134.
1894. *Listronotus setosus* LeConte. Hamilton, Can. Ent., XXVI, pp. 253, 256.
1916. *Listronotus setosus* LeConte. Blatchley and Leng, Rhynchophora of North Eastern America, p. 163.
1920. *Listronotus setosus* LeConte. Leng, Catalogue of the Coleoptera of America, North of Mexico, p. 317.
1931. *Listronotus setosus* LeConte. Schenkling and Marshall, *in* Junk, Coleopterorum Catalogus, Subfam. Cylindrorrhininae, Pars 114, p. 12.

ORIGINAL DESCRIPTION. "Blackish, covered with a dense crust of dirty gray and brownish round scales, larger upon the prothorax, and not becoming hair-like upon the head. Beak moderately tricarinate and quadrisulcate. Prothorax distinctly wider than long, sides suddenly rounded near the base and apex. Scutellum pale. Elytra not much wider than the prothorax, slightly emarginate at base; humeri rounded, striae punctured, interspaces slightly convex, with rows of clavate bristles longer and more evident than the setae of the other species; tip conjointly rounded in both sexes.

"Male. Last ventral slightly impressed at the tip.

"Female. Last ventral deeply impressed at the tip.

"Florida and Georgia: Messrs. Hubbard and Schwarz. Very easily recognized by the scaly head and long clavate bristles."

ADDITIONAL DESCRIPTION. Length, 5 to 6.5 mm. *Beak* distinctly longer than prothorax; slender and curved; broad and flattened at base, with a rather wide ridge extending laterally over basal half of antennal groove; median carina prominent; lateral carinae usually rather distinct; lateral sulci deep; surface densely punctate; basal portion clothed with rounded scales; outer part with narrow scales and setae. *Head* flat; densely and coarsely punctate, thickly

covered with rounded scales; frontal fovea deep. *Antennae* slender; second segment of funicle only one-half longer than first; third segment very slightly elongate. *Prothorax* one-fifth wider than long; sides strongly rounded at base and apex; ocular lobes moderately large; disk sometimes with a faint median carina, abbreviated at base and apex; surface roughly granulate-punctate, thickly covered with scales which are much larger than those of the elytra, are slightly convex, and are often polygonal rather than rounded; a few scattered, very long, stout setae arising from punctures at the apices of small tubercles. *Scutellum* round, often elevated; thickly covered with small grayish scales. *Elytra* with striae fine, not deeply impressed, but strongly punctate, the punctures close-set; intervals convex, the odd ones more strongly so. *Ventral surface* coarsely and somewhat sparsely punctate, with rounded scales at sides of metathoracic sternum and third, fourth, fifth, and sixth abdominal sterna; elsewhere with very short setae. *Male* with third abdominal sternum broadly and deeply concave. *Female* with third abdominal sternum flat or very slightly convex; seventh sternum with a narrow but very deep longitudinal groove beginning before the middle and extending to the apex, causing it to be strongly notched when viewed from the end; seventh tergum very deeply emarginate, the emargination fitting around the notch of the seventh sternum.

NOTES ON TYPES. The types of *L. setosus* LeConte have been examined, and are located in the LeConte collection in the Museum of Comparative Zoölogy at Harvard College. The first type is a female from "Cedar Keys, Fla." The second type is a female from "Tampa, Fla." The third type is a male bearing an orange disk, and is probably from Georgia, since that state is given as a locality in the original description. There is a fourth specimen in the series, a male, without a type label, but with the label, "Fla."

BIOLOGICAL NOTES. Blatchley and Leng (1916) recorded the species as being "frequent beneath boards along the margins of ponds and on the flowers of Sagittaria." Pierce has recorded *L. setosus* LeConte as occurring on cotton at Victoria, Texas, May 23. A specimen upon which this record is based has been examined and is not *L. setosus* LeConte as determined by Pierce, but is *L. rotundicollis* LeConte.

DATA ON DISTRIBUTION. Most of the specimens examined have been from Florida. I have seen three specimens, however, from the northern states, one from Massachusets, and two from New York City. This northern distribution may appear to be peculiar,

but there is a region, especially around Martha's Vineyard, Massachusetts, where a number of typically subtropical forms of plants and animals have been found. These forms, as in the case of *L. setosus* LeConte, occur most abundantly in Florida and may be found in small numbers along the coastal region of Massachusetts and New York, not being found in the territory between these two localities. Specimens have been examined from the following localities:

Florida:

Fla.; Tampa, Fla., 22.4, 28.4, and 1.5; Sebastian Riv., Fla., 7.4, Coll. Hubbard & Schwarz; Dunedin, Fla., 2-4-1913, Feb. 18, 1913, Feb. 18, 1914, 3-1-24, 3-2-13, 3-18-13, 3-23-20, and 4-2-21, W. S. Blatchley Coll.; Cedar Keys, Fla., June 6; Bellair, Fla.; Jacksonv., Fla.; Homestead, Fla., June, 1929, Darlington; Kissimmee, Fla.; Dunedin, Pinellas Co., Fla., III-17-1925.

Georgia:

Georgia.

New York:

New York, N. Y.

Massachusetts:

Mass.

Listronotus debilis Blatchley 1916

(Plate XXXI, fig. 3; Plate XXXVII, fig. 7)

1916. *Listronotus debilis* Blatchley, *in* Blatchley and Leng, Rhynchophora of North Eastern America, p. 164.

1920. *Listronotus debilis* Blatchley. Leng, Catalogue of the Coleoptera of America, North of Mexico, p. 317.

1925. *Listronotus debilis* Blatchley. Blatchley, Jr. N. Y. Ent. Soc., Vol. XXXIII, p. 92.

1931. *Listronotus debilis* Blatchley. Schenkling and Marshall, *in* Junk, Coleopterorum Catalogus, Subfam. Cylindrorrhininae, Pars 114, p. 11.

ORIGINAL DESCRIPTION. "Oblong, rather robust. Black, above and under surface, except abdomen, densely clothed with a crust of small, round, dirty white scales, each with a minute golden dot at center; antennae, tibiae and tarsi reddish-brown; femora piceous, densely scaly near apex. Beak slender, subcylindrical, as long as head and thorax, naked, feebly carinate and slightly widened on apical third, not carinate and densely scaly behind the antennae; frontal fovea large, deep. Thorax slightly wider than long, sides broadly rounded, feebly but distinctly sinuate at middle, disc densely and finely granulate-punctate. Elytra at base one-third wider than middle of thorax, humeri rounded, sides parallel to apical fourth, then converging to the conjointly rounded apex; striae very fine, their punctures concealed; intervals wide, flat, each with a row of short, white inclined bristles. Length, 5.5 mm.

"Putnam and Vigo counties, Indiana, rare; June 12-July 1.

a unique form, easily known by the peculiar color of scales, sinuate thorax and scaly head. The last ventral is not impressed in either of the two specimens, both of which are probably males."

Additional Description. *Length,* 5.5 to 7 mm. *Beak* noticeably longer than prothorax, slender, curved; when viewed from above it narrows to the point of the insertion of the antennae and then becomes wider toward the tip; with a fine median carina; lateral carinae and lateral grooves obsolete; upper surface finely punctate, clothed with rounded scales to point of antennal insertion, then with only a few scattered short, slender setae on apical portion. *Antennae* slender; second segment of funicle only about one-half longer than first; third segment very slightly elongate, but not as long as first; fourth to seventh segments rounded. *Head* slightly flattened between the eyes. *Prothorax* about one-eighth wider than long; ocular lobes moderately developed; sides sometimes broadly and evenly curved, in other cases nearly parallel along median portion and rather suddenly curved inward at base and apex; median sinuation of sides not always evident as mentioned in the original description; scales of disk of prothorax slightly convex; a few scattered stout setae, without the coarser punctures found in many of the other species. *Elytra* only very slightly arcuate at base; setae of intervals rather prominent, distantly placed, more prominent and slightly clavate on declivity. *Ventral surface* clothed mostly with slender setae; sides of metasternum with rounded scales, and a few on the sides of the third and fourth abdominal sterna. *Male* with beak only slightly longer than prothorax; third abdominal sternum deeply concave at middle; all the abdominal sterna finely and moderately punctate, the seventh with a median apical area which is nearly smooth, having only a few scattered tiny punctures; tips of elytra conjointly rounded. *Female* with base of third abdominal sternum flat or slightly convex, sometimes with a small median concavity at the posterior margin; seventh sternum scarcely modified, having only a median apical area which is less densely and more finely punctate, this region being very slightly depressed; apex of seventh sternum truncate; apex of seventh tergum slightly emarginate at middle; tips of elytra very slightly separately subacuminate.

Notes on Types. The type of this species, a female from Putnam county, Indiana, has been examined. The second specimen which Blatchley had before him when he described the species is a male from Vigo county, Indiana. The type is in the Blatchley collection at Purdue University.

BIOLOGICAL NOTES. The food plant of this species is not known. It was taken at light on July 6, at Oakwood, Ill.

DATA ON DISTRIBUTION. The species has been previously recorded only from Indiana. We now know that its range extends southeast through Maryland and the District of Columbia to Virginia, and southwest through Illinois, Kansas, and Oklahoma. Specimens have been examined from the following localities:

Indiana:

Marion Co., Ind., 5-18-21, 5-19-21, 5-21-22, 6-14-'22, and 9-23-22, W. S. B.; Marion Co., Ind., VII-14-1924 and X-9-1924, Blatchley; Putnam Co., Ind., 6-12-14, W. S. B.; Vigo Co., Ind., W. S. B.

Maryland:

Md. near Plummers I., May 27, 1916, L. O. Jackson Collector; Plummers Is., Md., VI-17-13; Great Falls, Md.

District of Columbia:

Washington, D. C., 19-6-05, W. L. McAtee Collector; Washgtn., D. C.

Virginia:

Va., near Plummer I., Md., Aug., 1923, H. S. Barber.

Illinois:

Oakwood, Ill., July 6, 1927, Coll. R. G. & T. F., at light; Urbana, Ill., September 26, '07.

Kansas:

Chanute, Kansas, Sept. 25, 1922, Wm. E. Hoffmann.

Oklahoma:

Spavinaw, Okla., June 18, 1937, Standish-Kaiser; Sherwood, Okla., June 27, 1937, Standish-Kaiser.

LIST OF SPECIES AND SYNONYMY

LISTRONOTUS Jekel.

1. CAUDATUS (Say) 1824.
2. INGENS n. sp.
3. AMERICANUS LeConte 1876.
4. CALLOSUS LeConte 1876.
5. SQUAMIGER (Say) 1831.
   inaequalipennis (Boheman) 1842.
6. TUBEROSUS LeConte 1876.
7. SORDIDUS (Gyllenhal) 1834.
   distinguendus (Gyllenhal) 1834.
   obliquus LeConte 1876.
8. MANIFESTUS n. sp.
9. ROTUNDICOLLIS LeConte 1876.
   cribricollis LeConte 1876.
10. DISTINCTUS n. sp.
11. SCAPULARIS Casey 1895.
12. BLATCHLEYI n. sp.
13. PALUSTRIS Blatchley 1916.

14. BLANDUS n. sp.
15. FRONTALIS LeConte 1876.
16. OREGONENSIS (LeConte) 1860.
    latiusculus LeConte 1876 *nec* Boheman 1842.
    impressifrons LeConte 1876.
    rudipennis Blatchley 1916.
17. OREGONENSIS subspecies TESSELLATUS Casey 1895.
18. ELEGANS Van Dyke 1929.
19. NEBULOSUS LeConte 1876.
    sulcirostris LeConte 1876.
20. SIMILIS n. sp.
21. APPENDICULATUS (Boheman) 1842.
    floridensis Blatchley 1916.
    leucozonatus Chittenden 1926.
    impressus Van Dyke 1929.
22. INSIGNIS n. sp.
23. SETOSUS LeConte 1876.
24. DEBILIS Blatchley 1916.

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PLATE XXXI

FIG. 1. *L. americanus* LeConte. Dorsal and lateral views of median lobe of male.

FIG. 2. *L. ingens* n. sp. Dorsal and lateral views of median lobe of male.

FIG. 2a. *L. ingens* n. sp. Apex of median lobe of male.

FIG. 3. *L. debilis* Blatchley. Dorsal and lateral views of median lobe of male.

FIG. 4. *L. tuberosus* LeConte. Dorsal and lateral views of median lobe of male.

PLATE XXXI

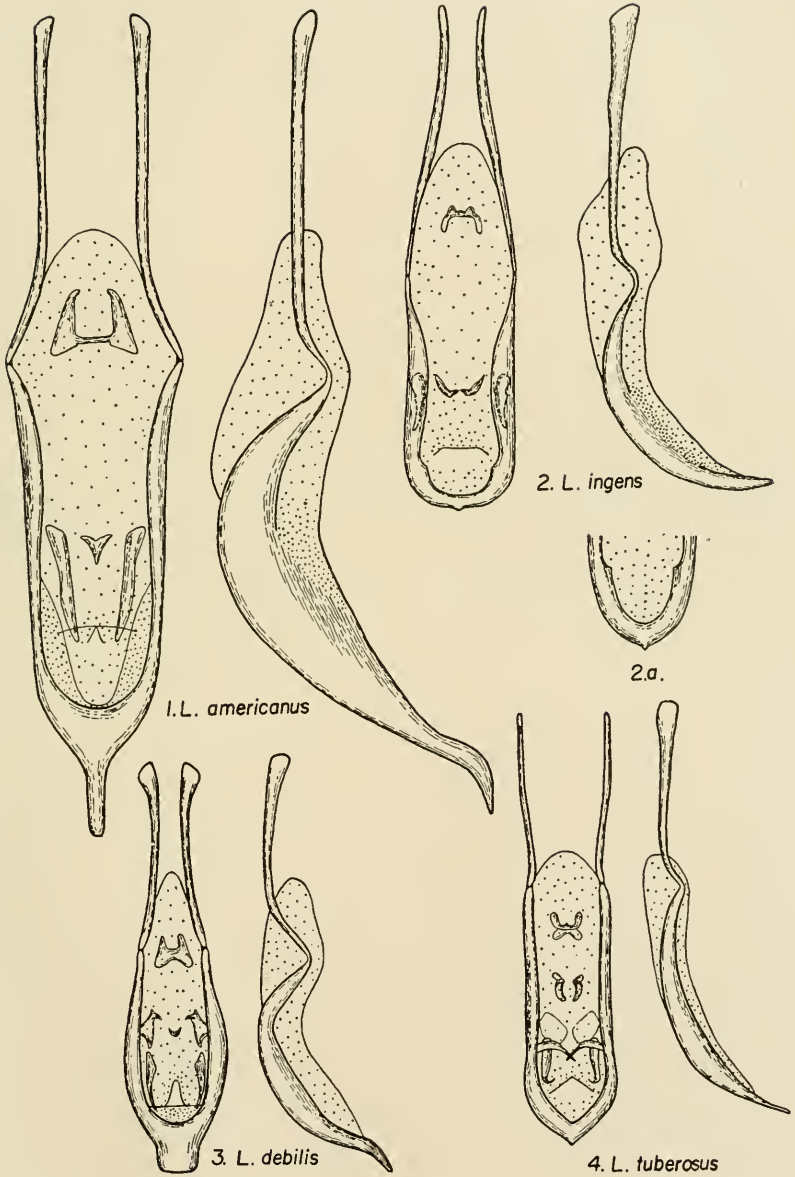


PLATE XXXII

FIG. 1. *L. insignis* n. sp. Dorsal and lateral views of median lobe of male.

FIG. 2. *L. caudatus* (Say). Dorsal and lateral views of median lobe of male.

FIG. 3. *L. frontalis* LeConte. Dorsal and lateral views of median lobe of male.

FIG. 4. *L. nebulosus* LeConte. Dorsal and lateral views of median lobe of male.

PLATE XXXII

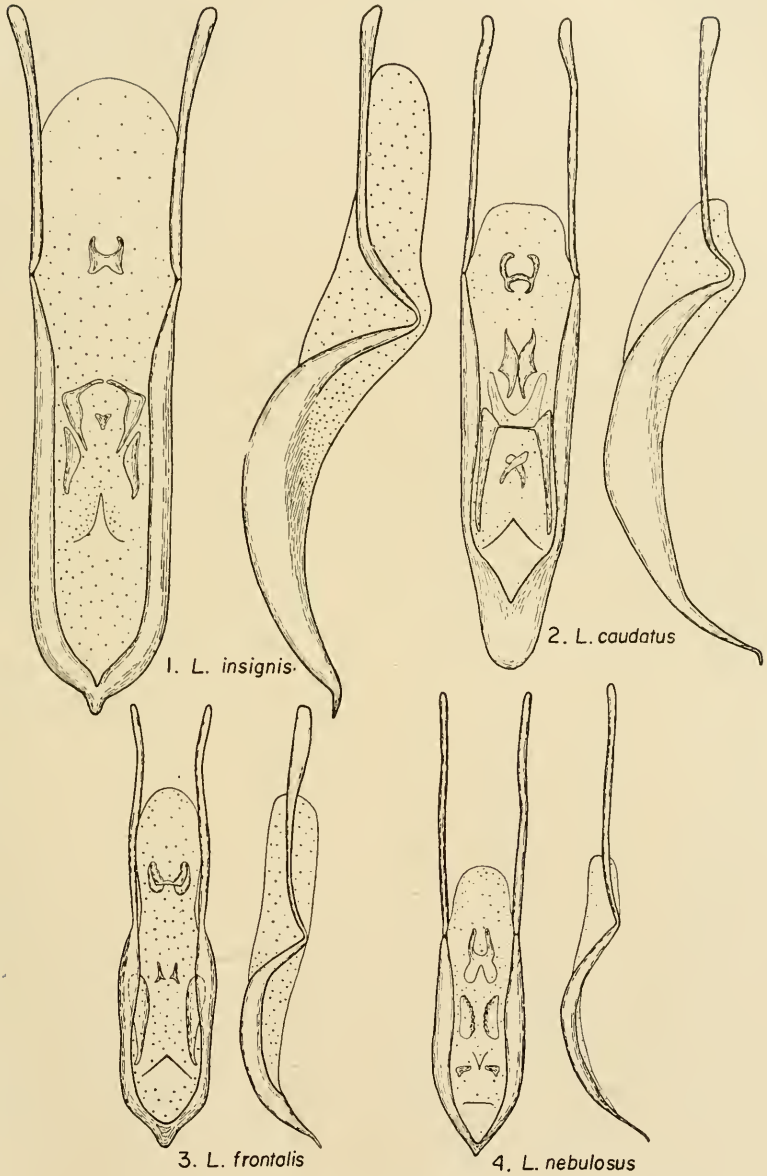


PLATE XXXIII

FIG. 1. *L. oregonensis* (LeConte). Dorsal and lateral views of median lobe of male.

FIG. 2. *L. appendiculatus* (Boheman). Dorsal and lateral views of median lobe of male.

FIG. 3. *L. setosus* LeConte. Dorsal and lateral views of median lobe of male.

FIG. 4. *L. palustris* Blatchley. Dorsal and lateral views of median lobe of male.

FIG. 5. *L. sordidus* (Gyllenhal). Dorsal and lateral views of median lobe of male.

PLATE XXXIII

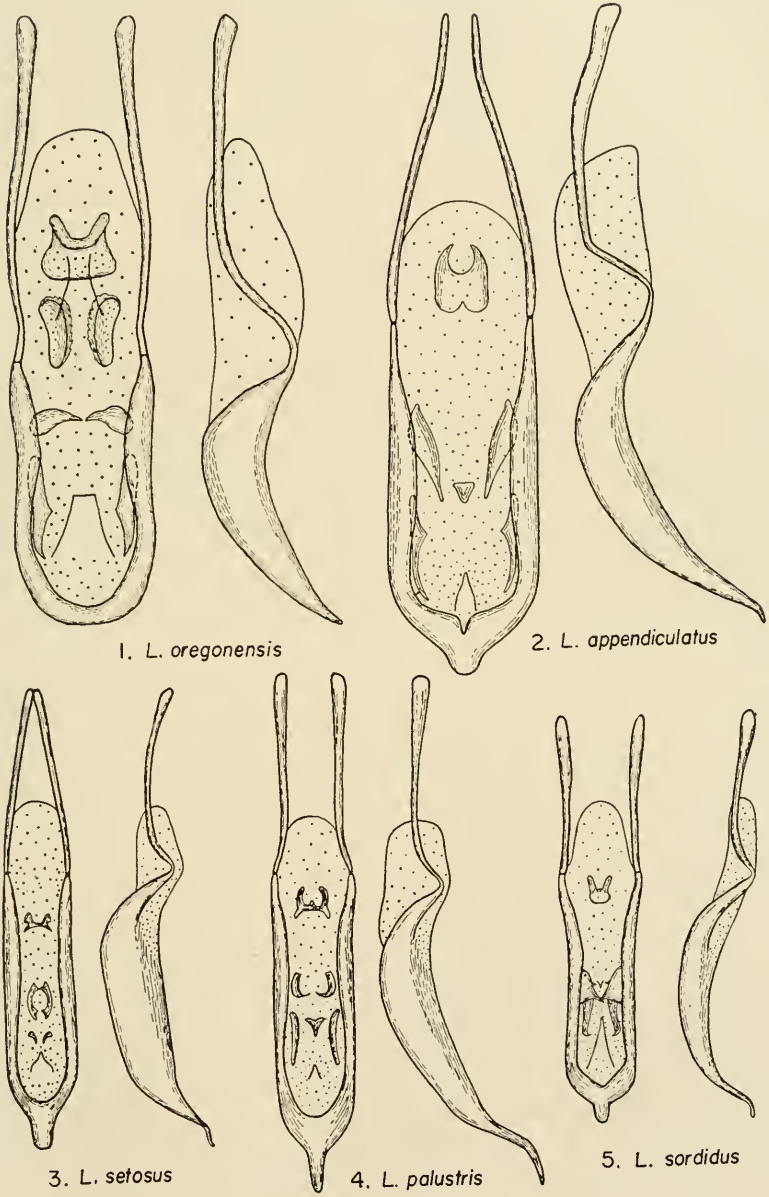


PLATE XXXIV

FIG. 1. *L. blandus* n. sp. Dorsal and lateral views of median lobe of male.

FIG. 2. *L. distinctus* n. sp. Dorsal and lateral views of median lobe of male.

FIG. 3. *L. rotundicollis* LeConte. Dorsal and lateral views of median lobe of male.

FIG. 4. *L. callosus* LeConte. Dorsal and lateral views of median lobe of male.

PLATE XXXIV

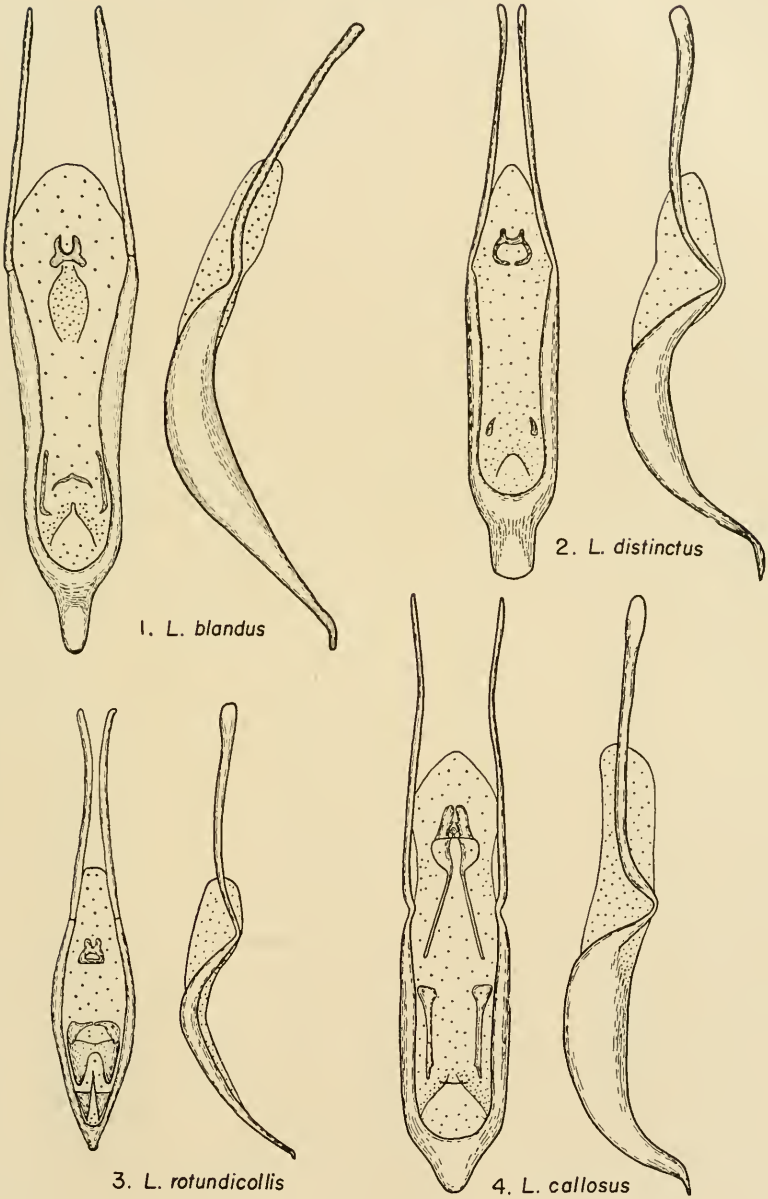


PLATE XXXV

FIG. 1. *L. scapularis* Casey. Dorsal and lateral views of median lobe of male.

FIG. 2. *L. blatchleyi* n. sp. Dorsal and lateral views of median lobe of male.

FIG. 3. *L. squamiger* (Say). Dorsal and lateral views of median lobe of male.

FIG. 4. *L. manifestus* n. sp. Dorsal and lateral views of median lobe of male.

PLATE XXXV

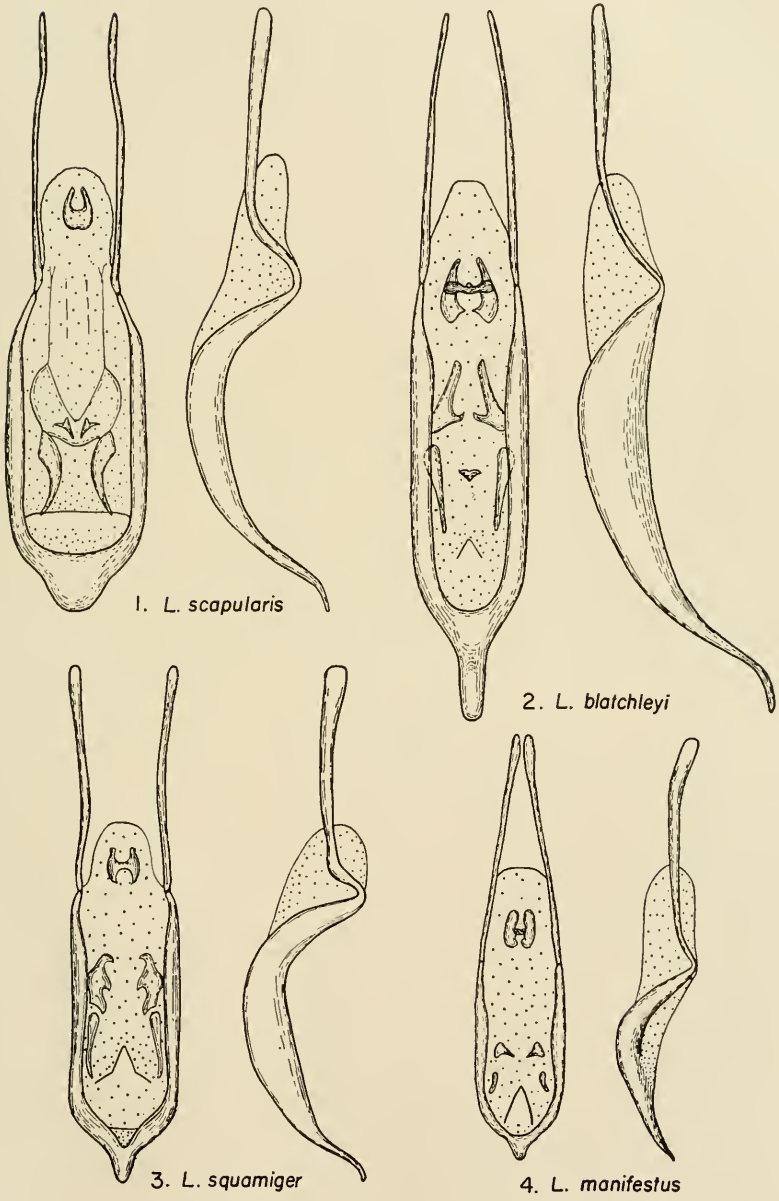
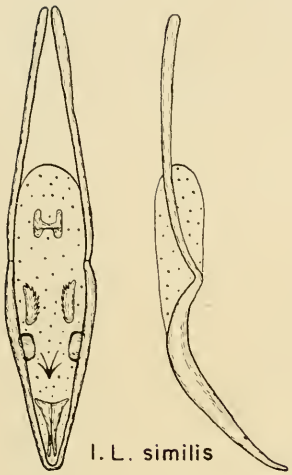
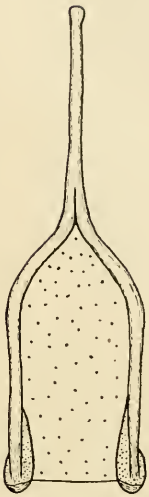


PLATE XXXVI

FIG. 1. *L. similis* n. sp. Dorsal and lateral views of median lobe of male.
FIG. 2. *L. distinctus* n. sp. Eighth sternum of female.
FIG. 3. *L. appendiculatus* (Boheman). Eighth sternum of female.
FIG. 4. *L. squamiger* (Say). Eighth sternum of female.
FIG. 5. *L. scapularis* Casey. Eighth sternum of female.
FIG. 6. *L. callosus* LeConte. Eighth sternum of female.
FIG. 7. *L. setosus* LeConte. Eighth sternum of female.
FIG. 8. *L. manifestus* n. sp. Eighth sternum of female.
FIG. 9. *L. sordidus* (Gyllenhal). Eighth sternum of female.
FIG. 10. *L. palustris* Blatchley. Eighth sternum of female.

PLATE XXXVI





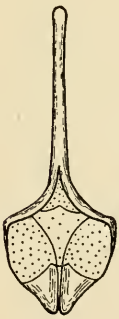
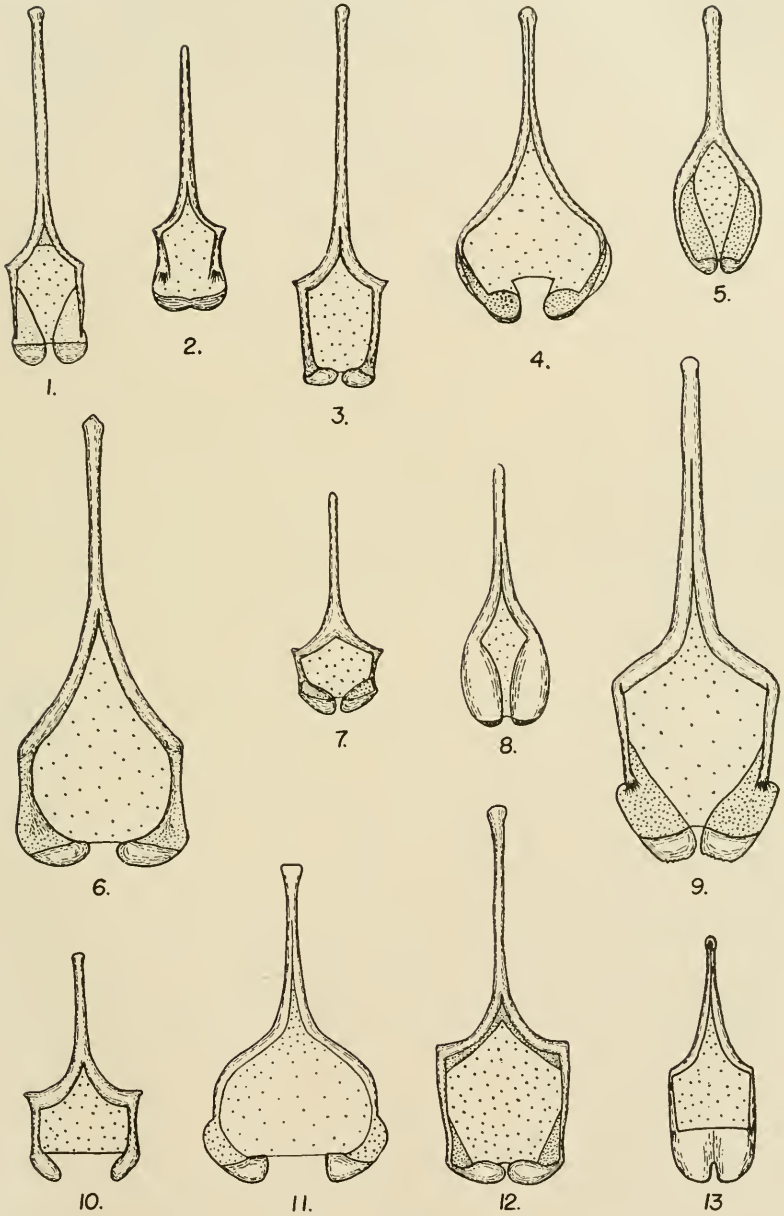


PLATE XXXVII

FIG. 1. *L. blandus* n. sp. Eighth sternum of female.
FIG. 2. *L. tuberosus* LeConte. Eighth sternum of female.
FIG. 3. *L. insignis* n. sp. Eighth sternum of female.
FIG. 4. *L. ingens* n. sp. Eighth sternum of female.
FIG. 5. *L. rotundicollis* LeConte. Eighth sternum of female.
FIG. 6. *L. oregonensis* (LeConte). Eighth sternum of female.
FIG. 7. *L. debilis* Blatchley. Eighth sternum of female.
FIG. 8. *L. nebulosus* LeConte. Eighth sternum of female.
FIG. 9. *L. americanus* LeConte. Eighth sternum of female.
FIG. 10. *L. elegans* Van Dyke. Eighth sternum of female.
FIG. 11. *L. caudatus* (Say). Eighth sternum of female.
FIG. 12. *L. blatchleyi* n. sp. Eighth sternum of female.
FIG. 13. *L. frontalis* LeConte. Eighth sternum of female.

PLATE XXXVII



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Distribution Notes and Comments upon a Collection of Mexican Lepidoptera

Part I—Rhopalocera

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ABSTRACT: In this paper 189 species of butterflies are listed. Nine species are new to Mexico. *Thecla istapa* Reakirt is taken out of the synonymy and is used for the Mexican subspecies of *Callicista columella* (Fabr.). *Lycaena alce* Edwards is also taken from the synonymy and is used for the United States and northern Mexican subspecies of *Hemiargus isola* (Reakirt). The variation of a number of species is discussed. A number of the locality records are new.

DURING an extensive collecting expedition in Mexico in the summer of 1938 by Mr. L. J. Lipovsky and Mr. H. D. Thomas, the former secured a fairly larger number of Lepidoptera, most of which have been deposited in the Snow Entomological Museum of the University of Kansas. This collection, added to a collection of Rhopalocera taken by H. D. Thomas during his trip through Mexico in the summer of 1936, contains a total of 189 species. Included in this number are nine species not before known to occur in Mexico. Although none of the localities were collected thoroughly for Lepidoptera, since the expeditions were organized mainly to secure aquatic Hemiptera and other orders of insects, a great number of locality records are new.

PAPILIONOIDEA

SATYRIDAE

1. *Euptychia hesione hesione* (Sulz.).
   SAN LUIS POTOSI. Huichihuayan, September 25, 1938, four males; ten miles south of Huichihuayan, September 25, 1938, one male, one female.
2. *Euptychia similis similis* Butler.
   SAN LUIS POTOSI. Huichihuayan, September 25, 1938, one male.
3. *Euptychia cleophes* Godman & Salvin.
   SAN LUIS POTOSI. Huichihuayan, September 25, 1938, one female.
4. *Megisto hermes hermes* (Fabricius).
   SAN LUIS POTOSI. Huichihuayan, September 25, 1938, six males, one female. CAMPECHE. Hacienda Balchakaj, Rio Chumpan, September 11, 1936, one female.
5. *Pindis squamistriga* Felder.
   MORELOS. Cuernavaca, August 3, 1938, one male. JALISCO. Chapala, September 11, 1938, one male.

MORPHIDAE

6. *Morpho polyphemus* Dbl. & Hew.
   CAMPECHE. Hacienda Balchakaj, Rio Chumpan, September 11, 1936, one female.
7. *Morpho peleides montezuma* Guerin.
   SAN LUIS POTOSI. Ten miles south of Huichihuayan, September 25, 1938, two males.

BRASSOLIDAE

8. *Opsiphanes boisduvalii* Westwood.
   SAN LUIS POTOSI. Huichihuayan, September 25, 1938, one female.
9. *Opsiphanes cassina fabricii* (Boisduval).
   CAMPECHE. Hacienda Balchakaj, Rio Chumpan, September 11, 1936, one male.

NYMPHALIDAE

HELICONIINAE

10. *Heliconius petiverana petiverana* (Dbl. & Hewit.).
    SAN LUIS POTOSI. Huichihuayan, September 25, 1938, two males.
11. *Heliconius charithonia charithonia* (Linnaeus).
    SAN LUIS POTOSI. Huichihuayan, September 25, 1938, seventeen males, four females. GUERRERO. Acapulco, August 16-30, 1938, three males, one female. MORELOS. Cuernavaca, August 3, 1938, two males, one female. CAMPECHE. Hacienda Balchakaj, Rio Chumpan, September 11, 1936, one male.
12. *Eueides cleobaea zorcaon* Reakirt.
    SAN LUIS POTOSI. Huichihuayan, September 25, 1938, one male, one female.
13. *Dryas julia moderata* Stichel.
    SAN LUIS POTOSI. Huichihuayan, September 25, 1938, three males.
14. *Dryas phaetusa phaetusa* (Linnaeus).
    CAMPECHE. Hacienda Balchakaj, September 11, 1936, two males.

15. *Dione juno huascuma* (Reakirt).
MORELOS. Cuernavaca, August 3, 1938, one male, two females.
16. *Dione vanillae incarnata* Riley.
TAMAULIPAS. Ten miles south of Ciudad Victoria, July 25, 1938, two males. MORELOS. Cuautla, July 28, 1938, one female. GUERRERO. Tierra Colorada, August 15, 1938, one male, one female.

NYMPHALINAE

17. *Euptoieta claudia claudia* (Cramer).
MICHOACAN. Morelia, September 24, 1938, one male.
18. *Euptoieta hegesia* (Cramer).
GUERRERO. Tierra Colorada, August 15, 1938, four males; Acapulco, August 16-30, 1938, one male. TAMAULIPAS. Ten miles south of Ciudad Victoria, July 25, 1938, one male.
19. *Melitaea theona theona* Mene.
MICHOACAN. Morelia, September 4, 1938, three males and three females. JALISCO. Union de Tula, September 16, 1938, one male.
The specimen from Union de Tula is considerably darker on both surfaces than those from Morelia.
20. *Melitaea elada elada* (Hewitson).
JALISCO. Tecolotlan, September 14, 1938, nineteen males; Union de Tula, September 16, 1938, nineteen males; Km. 90, Road to Autlan, September 17, 1938, one male; Cocula, September 17, 1938, four males; Cojumatlan, September 9, 1938, one female. GUERRERO. Acapulco, August 16-20, 1938, one male; Tierra Colorada, August 15, 1938, two males. MORELOS. Cuernavaca, August 3, 1938, one male; Cuautla, July 28, 1938, two males.
21. *Phyciodes vesta boucardi* Godman & Salvin.
JALISCO. Union de Tula, September 16, 1938, one male.
22. *Phyciodes mylitta pallida* Edw.
JALISCO. Chapala, September 11, 1938, one male.
A new record for Mexico.
23. *Phyciodes tharos tharos* (Drury).
JALISCO. Cojumatlan, September 9, 1938, one male, one female.
24. *Phyciodes fragilis guatemalena* (Bates).
SAN LUIS POTOSI. Huichihuayan, September 25, 1938, one male.
25. *Anthanassa texana texana* Edwards.
JALISCO. Chapala, September 11, 1938, two males, one female.
26. *Anthanassa tulcis* (Bates).
SAN LUIS POTOSI. Huichihuayan, July 27, 1938, one male.
27. *Anthanassa ardys* Hewit.
JALISCO. Union de Tula, September 16, 1938, two males.
28. *Anthanassa ptolyca* Bates.
JALISCO. Union de Tula, September 16, 1938, four males.
29. *Chlosyne hyperia hyperia* (Fabr.).
GUERRERO. Taxco, August 2, 1938, one male.
30. *Chlosyne melanarge* (Bates).
GUERRERO. Tierra Colorada, August 15, 1938, eight males.

31. *Chlosyne marina* (Hübner).

GUERRERO. Tierra Colorada, August 15, 1938, one male.

32. *Chlosyne lacinia lacinia* (Geyer).

JALISCO. Cojumatlan, September 9, 1938, one male, one female; Cocula, September 17, 1938, two males; Union de Tula, eight males; Tecolotlan, September 14, 1938, one male. MORELOS. Cuautla, July 28, 1938, one male.

There is a great deal of variation in this subspecies as in the one below. The male from Cuautla, one of the males from Cocula and four of the males from Union de Tula have entirely black hind wings on the upper surfaces and thus represent a form of the typical subspecies that seems to be parallel in development to the form *nigrescens* Wright of *C. lacinia crocale*.

33. *Chlosyne lacinia crocale* (Edwards).

CHIHUAHUA. Chihuahua, July 21, 1938, one male, four females. SAN LUIS POTOSI. Huichihuayan, September 25, 1938, one male.

None of these specimens are of the typical form *crocale* Edw. The male and two of the females from Chihuahua are of the orange suffused form named *rufescens* Wright. The remaning two females are probably also of the *rufescens* form, but approach typical *crocale* in having pure white spots on the forewings, both above and below. The male from Huichihuayan is of the form *nigrescens* Wright.

34. *Morpheis ehrenbergi* Hübner.

MORELOS. Cuernavaca, August 3, 1938, one female. JALISCO. Chapala, September 11, 1938, one female.

35. *Microtia elva elva* Bates.

GUERRERO. Tierra Colorada, August 15, 1938, six males. MORELOS. Cuernavaca, August 3, 1938, one male.

36. *Mestra amymone* (Men.)

TAMAULIPAS. Ten miles south of Ciudad Victoria, July 25, 1938, two males.

37. *Didonis biblis aganisa* Bdv.

SAN LUIS POTOSI. Huichihuayan, September 25, 1938, one male. TAMAULIPAS. Ten miles south of Ciudad Victoria, July 25, 1938, one male.

38. *Vanessa cardui carduelis* (Cramer).

CHICHUAHUA. Naica, July 21, 1938, one female.

39. *Precis coenia nigrosuffusa* (B. & McD.).

JALISCO. Chapala, September 14, 1938, one male; Union de Tula, September 16, 1938, one male. MICHOACAN. Morelia, September 4, 1938, one female. TAMAULIPAS. Antiquo Morelos, July 26, 1938, one male.

40. *Anartia fatima fatima* Fabr.

SAN LUIS POTOSI. Huichihuayan, July 27, 1938, five males, one female,

41. *Anartia fatima venusta* Fruhst.

GUERRERO. Acapulco, August 16-30, 1938, four males, one female.

This subspecies is easily distinguished from typical *fatima* in several characters. The submarginal white band of the upper side of hind wings extends only to vein M_2 in *venusta*, whereas in typical *fatima* it continues to the anal angle, although it is usually only faintly indicated in inter-

spaces Cu_1 and Cu_2. In the female of *venusta* this band is continued below vein M_2 as a series of three orange-red spots. In the female of typical *fatima* this band is white throughout. The red submesial band of hind wings is twice as broad in *venusta* and is much brighter in color. In interspace M_1 of hind wings, between the submesial red band and submarginal white band there is a round, black spot, very distinct on the under surface and at least slightly indicated on the upper surface. In the typical subspecies this spot is usually absent, but, if present, is very inconspicuous and usually lies next to the white band.

42. *Anartia jatrophae jatrophae* (Linn.).
TAMAULIPAS. Ten miles south of Ciudad Victoria, July 25, 1938, one female; Antiquo Morelos, July 26, 1938, one male. SAN LUIS POTOSI. Huichihuayan, September 27, 1938, one male. GUERRERO. Tierra Colorada, August 15, 1938, one male, two females. CAMPECHE. Ciudad del Carmen, September 1-7, 1938, one female.
43. *Eunica monima modesta* (Bates).
SAN LUIS POTOSI. Huichihuayan, September 25, 1938, one male.
44. *Myscelia ethusa* (Bdv.).
SAN LUIS POTOSI. Huichihuayan, September 25, 1938, one male, two females; July 27, 1938, one male, one female.
45. *Myscelia cyaniris* Dbl. & Hew.
SAN LUIS POTOSI. Huichihuayan, September 25, 1938, one female.
46. *Dynamine mylitta* (Cramer).
SAN LUIS POTOSI. Huichihuayan, September 25, 1938, two males three females, July 27, 1938, one male.
47. *Cyclogramma bachis* (Dbl.).
JALISCO. Union de Tula, September 16, 1938, two females.
48. *Ageronia februa gudula* Fruhst.
GUERRERO. Acapulco, August 16-30, 1938, four males, three females.
49. *Ageronia atlantis* Bates.
JALISCO. Cocula, September 17, 1938, one male. MORELOS. Cuautla, July 28, 1938, one male.
50. *Ageronia feronia farinulenta* Fruhst.
SAN LUIS POTOSI. Huichihuayan, September 25, 1938, one female.
51. *Ageronia guatemalena marmarice* Fruhst.
GUERRERO. Acapulco, August 16-30, 1938, three males, two females.
52. *Ageronia* sp.
SAN LUIS POTOSI. Huichihuayan, July 25, 1938, one male. A very light-colored species, possibly related to *A. februa* Hbn.
53. *Athena chiron* (Fabr.).
SAN LUIS POTOSI. Huichihuayan, July 27, 1938, three males, one female. TAMAULIPAS. Antiquo Morelos, July 26, 1938, one male.
54. *Basilarchia archippus obsoleta* Edwards.
CHIHUAHUA. Chihuahua, July 24, 1938, one female.
55. *Heterochroa bredowii bredowii* Geyer.
JALISCO. Km. 90, Road to Autlan, September 17, 1938, one male.
MICHOCAN. Carapa, September 2, 1938, one male.
56. *Adelpha fessonia* Hewitson.
TAMAULIPAS. Antiquo Morelos, July 26, 1938, one female; Forlon, September 30, 1938, one male.

57. *Adelpha salmoneus emilia* Fruhst.
SAN LUIS POTOSI. Huichihuayan, September 25, 1938, one female. This species has not been taken in Mexico before.
58. *Chlorippe mentas* Bdv.
SAN LUIS POTOSI. Huichihuayan, September 25, 1938, one female. *C. mentas* has heretofore been known only from Honduras.
59. *Asterocampa leilia* (Edw.).
CHIHUAHUA. Chihuahua, July 21, 1938, two males; Naica, July 21, 1938, two males, one female.
60. *Smyrna blomfildia datis* Fruhst.
JALISCO. Km. 90, Road to Autlan, September 17, 1938, one male. GUERRERO. Acapulco, August 16-30, 1938, one male.
61. *Hypna rufescens rufescens* Butler.
GUERRERO. Acapulco, August 16-30, 1938, one male. This species has been recorded only from Venezuela.
62. *Anaea euryphile* Felder.
SAN LUIS POTOSI. Huichihuayan, September 25, 1938, one male.
63. *Anaea pithyusa* Felder.
TAMAULIPAS. Ten miles south of Ciudad Victoria, July 25, 1938, one female. CAMPECHE. Hacienda Balchakaj, Rio Chumpan, September 11, 1936, one female.
64. *Anaea aidea* Guerin.
TAMAULIPAS. Ten miles south of Ciudad Victoria, July 25, 1938, two males, one female. JALISCO. Chapala, September 11, 1938, one male; Cocula, September 17, 1938, one male.
65. *Anaea andria appiciata* Rober.
CAMPECHE. Hacienda Balchakaj, Rio Chumpan, September 11, 1936, one male.

DANAIDAE

DANAINAE

66. *Danaus plexippus plexippus* (Linn.).
CAMPECHE. Hacienda Balchakaj, Rio Chumpan, September 11, 1936, one male.
67. *Danaus cleothera* (Godart).
CAMPECHE. Hacienda Balchakaj, Rio Chumpan, September 11, 1936, two males.
68. *Danaus berenice strigosa* (Bates).
TAMAULIPAS. Antiquo Morelos, July 26, 1938, six males. CHIHUAHUA. San Pedro, July 24, 1938, one female; Naica, July 21, 1938, two males, one female; Chihuahua, July 21, 1938, one female.

ITHOMIINAE

69. *Dircenna klugi klugi* (Hbn.).
SAN LUIS POTOSI. Huichihuayan, September 25, 1938, one male.
70. *Leucothyris graciella paula* Weym.
SAN LUIS POTOSI. Huichihuayan, September 25, 1938, two males.
71. *Pteronymia cotytto* (Guerin).
SAN LUIS POTOSI. Huichihuayan, September 25, 1938, one male, three females.

72. *Hymenitis oto* (Hewitson).
SAN LUIS POTOSI. Huichihuayan, September 25, 1938, one male.

LIBYTHEIDAE

73. *Libythea bachmanii larvata* Strecker.
TAMAULIPAS. Ten miles south of Ciudad Victoria, July 25, 1938, one female; Magiscatzin, September 28, 1938, five males. JALISCO. Chapala, September 11, 1938, one female.
The Chapala specimen is larger than the others and differs in several particulars. One specimen from Forlon is of the form *streckeri* Field.

RIODINIDAE

EUSELASIINAE

74. *Euselasia hieronymi* (Godman & Salvin).
SAN LUIS POTOSI. Huichihuayan, September 25, 1938, one male.
75. *Euselasia cheles aurantiaca* (Godman & Salvin).
SAN LUIS POTOSI. Huichihuayan, September 25, 1938, one male. New to Mexico, having been known before only from Guatemala and Central America.

RIODININAE

76. *Mesosemia telegone tetrica* Stichel.
SAN LUIS POTOSI. Huichihuayan, September 25, 1938, one male.
77. *Anteros carausius carausius* Ww.
VERA CRUZ. Santa Lucrecia, September 24, 1936, one male.
78. *Lasaia sessilis* Schs.
JALISCO. Chapala, September 11, 1938, three males, one female.
79. *Apodemia walkeri* Godman & Salvin.
JALISCO. Chapala, September 11, 1938, one male, one female.
80. *Calephelis laverna* (Godman & Salvin).
SAN LUIS POTOSI. Huichihuayan, September 25, 1938, one male. JALISCO. Chapala, September 11, 1938, one female.
81. *Theone mania* Godman & Salvin.
MICHOACAN. Morelia, September 4, 1938, one female; El Sabino, nr. Uruapan, July 19, 1936, one male, one female.

LYCAENIDAE

THECLINAE

82. *Eumaeus minyas minyas* Hbn.
SAN LUIS POTOSI. Huichihuayan, September 25, 1938, one female. YUCATAN. Chichen Itza, August 30, 1936, one male.
83. *Atlides battus aufidena* (Hewitson).
VERA CRUZ. Santa Lucrecia, September 24, 1936, two males.
84. *Arawacus sito* (Boisduval).
SAN LUIS POTOSI. Huichihuayan, September 25, 1938, one male.
85. *Arawacus togarna togarna* (Hewitson).
VERA CRUZ. Santa Lucrecia, September 24, 1936, one female.
86. *Rekoa meton* (Cramer).
VERA CRUZ. Santa Lucrecia, September 24, 1936, one female.

87. *Eupsyche tephraeus* (Hübner).
VERA CRUZ. Santa Lucrecia, September 24, 1936, two males.

88. *Eupsyche syncellus deserta* (Draudt).
GUERRERO. Acapulco, August 28, 1938, one male; Tierra Colorada, August 15, 1938, one female. SAN LUIS POTOSI. Huichihuayan, September 25, 1938, one female.

89. *Eupsyche polibetes scdecia* (Hewitson).
VERA CRUZ. Santa Lucrecia, September 24, 1936, one male.

90. *Calycopis hesperitis hesperitis* (Butler).
SAN LUIS POTOSI. Huichihuayan, September 27, 1938, one male.

91. *Strymon echion cchiolus* (Draudt).
VERA CRUZ. Santa Lucrecia, September 24, 1936, one male.

92. *Strymon clytie* (Edw.).
VERA CRUZ. Santa Lucrecia, September 24, 1936, one female. JALISCO. Chapala, September 11, 1938, one male, one female.

93. *Strymon ines* (Edw.).
JALISCO. Chapala, September 11, 1938, two females.

94. *Strymon scopas* (Godman & Salvin).
VERA CRUZ. Santa Lucrecia, September 24, 1936, one female. MICHOACAN. El Sabino, nr. Uruapan, July 15-30, 1936, one female.

95. *Strymon* sp.
SAN LUIS POTOSI. Huichihuayan, September 25, 1938, one female.

96. *Callicista columella istapa* (Reakirt).
MORELOS. Cuernavaca, August 7, 1938, one male, one female. TAMAULIPAS. Ten miles south Ciudad Victoria, July 25, 1938, one female; sixty miles south Ciudad Victoria, July 6, 1936, one female.

Typical *columella* Fabricius was described from the West Indies. It ranges from there into Florida and through the Gulf States. A comparison of the above series of species with a series of typical *columella* from Miami, Fla., has led to the discovery that the Mexican specimens differ subspecifically from the Florida ones. The name *istapa* Reakirt, based upon specimens taken near Vera Cruz, Mexico, is available for the Mexican subspecies.

The main difference between *istapa* and *columella* is found in the reduced maculation on the under surfaces of the former subspecies. This is most evident in the submarginal spot in interspace Cu_1 of the hind wing. In *istapa* the light colored lunule on the inner side of the marginal black spot is yellow (not orange as is the case in typical *columella*) and rather thin, being less than half as thick as the black spot which it caps. In *columella* the orange lunule is large, being as thick or nearly as thick as the black spot. The ground color on the under surface of the wings is lighter in *istapa* than in *columella*, being a light grey and usually without the distinct brownish tinge found in *columella*.

97. *Callicista thius* (Hübner).
TAMAULIPAS. Ten miles south of Ciudad Victoria, July 25, 1938, one male.

This species has heretofore been recorded only from Brazil and Columbia.

98. *Dolymorpha jada* (Hewitson).
JALISCO. Tecolotlan, September 14, 1938, one male; Juchitlan, September 15, 1938, one male.
99. *Callophrys herodotus herodotus* (Fabricius).
VERA CRUZ. Santa Lucrecia, September 24, 1936, one female.

PLEBEJINAE

100. *Leptotes cassius* (Cramer).
JALISCO. Cocula, September 14, 1938, one male. GUERRERO. Tierra Colorada, August 15, 1938, one male.
101. *Leptotes marina* (Reakirt).
JALISCO. Union de Tula, September 6, 1938, one male; Tecolotlan, September 14, 1938, two males; Cocula, September 14, 1938, two males; Chapala, September 11, 1938, one male. CHIHUAHUA. Naica, two females
102. *Brephidium exilis* (Bdv.).
JALISCO. Cojumatlan, September 9, 1938, one female.
103. *Hemiargus gyas zachaeina* (Butler & Druce).
JALISCO. Chapala, September 11, 1938, four males, two females; Cocula, September 11, 1938, eight males; Cojumatlan, September 9, 1938, fifteen males, eight females; Union de Tula, September 6, 1938, three males; Tecolotlan, September 14, 1938, two males. MORELOS. Cuernavaca, August 3. 1938, one male. MICHOACAN. El Sabino, near Uruapan, July 15-30, 1936, two males, one female.
104. *Hemiargus isola isola* (Reakirt).
HIDALGO. Rio del Monte, September 23, 1936, twenty-nine males, one female.
105. *Hemiargus isola alce* (Edw.).
CHIHUAHUA. Naica, July 21, 1938, two males, two females. JALISCO. Cocula, September 17, 1938, one female; Chapala, September 11, 1938, one male.

The name *alce* Edw., based upon specimens from Colorado and usually referred to as a synonym of *isola* is in reality a good subspecies. Typical *isola,* described by Reakirt from specimens taken near Vera Cruz, Mexico, is slightly larger than *alce,* having an average wing expanse in the male sex of 24 millimeters. The single female specimen of *isola* in the series from Rio del Monte has an expanse of 27 millimeters. A series of twenty specimens of *alce* from Colorado, Kansas, Texas and Chihuahua was measured and found to have an average expanse of 22 millimeters in the male sex and 24 millimeters in the female sex. The most striking difference between the two subspecies is in the ground color of the under surfaces, which is dark grey in typical *isola* and light brownish-grey in *alce.* The palpus, underside of thorax and abdomen in *alce* are white, in *isola* grey.

106. *Hemiargus cyna* (Edwards) (=*tulliola* Godman & Salvin, new synonymy).
SAN LUIS POTOSI. Huichihuayan, September 25, 1938, one female.
107. *Everes comyntas comyntas* (Godart).
SAN LUIS POTOSI. Huichihuayan, September 25, 1938, one male.
108. *Lycaenopsis argiolus gozora* (Bdv.).
JALISCO. Cocula, September 17, 1938, one male.

PIERIDAE

109. *Colias (Zerene) caesonia caesonia* (Stoll.).

TAMAULIPAS. Forlon, September 30, 1938, two females; ten miles south Ciudad Victoria, July 25, 1938, one male. GUERRERO. Acapulco, August 16-30, 1938, one male. JALISCO. Cojumatlan, September 9, 1938, five males, three females; Union de Tula, September 16, 1938, one male.

These specimens compared with a series from Texas and Florida before the writer are somewhat larger (in the Mexican specimens the average length of forewing is 30 mm. in the male and 33 mm. in the female, while in specimens from either Texas or Florida the forewing averages 1 mm. less in each sex) and have slightly broader black borders to both fore and hind wings in the male and to the forewings of the females. These borders are on the average about 2 mm. wider in the Mexican specimens than in the Texan or Floridan specimens. Röber has described a subspecies under the name of *centralamericana* as having a very broad black margin to the hind wing. Whether these Mexican specimens represent this subspecies or not cannot be ascertained from Röber's inadequate description.

110. *Anteos clorinde clorinde* (Godart).

JALISCO. Cojumatlan, September 9, 1938, one male.

111. *Anteos maerula maerula* (Fabricius).

SAN LUIS POTOSI. Huichihuayan, September 25, 1938, one male, three females.

112. *Phoebis sennae marcellina* (Cramer).

TAMAULIPAS. Forlon, September 30, 1938, two males. HIDALGO. Aqua Fria, September 24, 1938, one female. SAN LUIS POTOSI. Huichihuayan, September 25, 1938, one male. CAMPECHE. Hacienda Balchakaj, Rio Chumpan, September 11, 1936, two males, one female.

The Forlon specimens are quite typical male *marcellina,* having considerable more markings underneath than in *Phoebis sennae eubule* (Linn.) (the only other subspecies found on continental North America). The specimen from Huichihuayan, however, is a dwarf and has the maculation on the under side of wings reduced to the normal spots at the end of the cells in the fore and hind wings and five small brownish dots in base of under surface of hind wing. It is thus similar to the form *drya* Fabr. of *P. sennae eubule.* The female from Aqua Fria represents the albinic form *pallida* Cockerell.

113. *Phoebis agarithe maxima* (Neum.).

TAMAULIPAS. Forlon, September 30, 1938, eight males, three females; ten miles south Ciudad Victoria, July 25, 1938, one male. SAN LUIS POTOSI. Huichihuayan, July 27, 1938, one male. JALISCO. Chapala, September 11, 1938, one female. CAMPECHE. Hacienda Balchakaj, Rio Chumpan, September 11, 1936, two males.

This subspecies, as compared with the other subspecies of *agarithe* is noted by the great decrease in reddish-brown maculation on the undersurfaces. There is considerable variation in the amount of this reduction both in the above specimens and also in typotypical specimens from Florida. Three of the Forlon specimens are entirely immaculate underneath except for the diagonal line on the forewing. Other specimens

have a few small reddish-brown spots scattered over the wing, while the rest are much more heavily marked. The maculation in this subspecies is never as heavy as in the other subspecies. One of the females from Forlon is of the albinic form *albarithe* Brown.

114. *Phoebis cypris* (Fabricius).

JALISCO. Union de Tula, September 6, 1938, two males.

These two specimens are of the form *neocipris* Huebner, having a flush of orange on the disc of both wings. The typical form is entirely yellow.

115. *Kricogonia lyside* (Godt.).

TAMAULIPAS. Forlon, September 30, 1938, six males, five females.

All of the above specimens, with one exception, are of the typical form, having a white ground color with a deep yellow base to the forewing and a slight suffusion of pale yellow on apex of forewing which is sometimes also found on the hind wings. A single specimen of the female form *unicolor* Godman & Salvin is represented in the above series. It is entirely yellow in color.

116. *Eurema* (*Eurema*) *jucunda* (Boisduval).

MORELOS. Cuernavaca, August 3, 1938, eleven males, eight females; August 12, 1938, one male. GUERRERO. Acapulco, August 16-30, 1938, three males, one female; Tierra Colorada, August 15, 1938, one female. JALISCO. Cocula, September 17, 1938, two males; Union de Tula, September 16, 1938, twenty-eight males; Tecolotlan, September 14, 1938, two males.

Two males from Cuernavaca and a single female from Acapulco are of the typical form *jucunda*. The remainder of the specimens belong to the form *sidonia* Felder in which the disc of the hind wing is greatly suffused with black from the borders which are in turn enlarged and prolonged around the wing to the anal angle and sometimes slightly along the abdominal margin. All of the *sidonia* females mentioned above are albinic and thus represent a form similiar to *pallidula* of typical *jucunda*.

117. *Eurema* (*Eurema*) *palmyra lydia* (Felder).

JALISCO. Union de Tula, September 16, 1938, one male; Tecolotlan, September 14, 1938, one male. MORELOS. Cuernavaca, August 3, 1938, one male. GUERRERO. Tierra Colorada, August 15, 1938, one male.

Males of this species differ from *jucunda* males only in having the hind wings white instead of yellow on the upper surfaces. It would seem to be merely a form or an aberration of *jucunda*.

118. *Eurema* (*Eurema*) *boisduvaliana* (Felder).

SAN LUIS POTOSI. Huichihuayan, September 25, 1938, one male. JALISCO. Union de Tula, September 16, 1938, one male. GUERRERO. Tierra Colorada, August 15, 1938, one male.

119. *Eurema* (*Eurema*) *mexicana mexicana* (Boisduval).

JALISCO. Union de Tula, September 16, 1938, 13 males.

120. *Eurema* (*Eurema*) *salome* (Felder).

JALISCO. Union de Tula, September 16, 1938, one male. This specimen is of the form *limoneus* Felder.

121. *Eurema* (*Eurema*) *albula albula* (Cramer).

SAN LUIS POTOSI. Huichihuayan, September 25, 1938, one male, and two females.

122. *Eurema* (*Abaeis*) *nicippe* (Cramer).
CHIHUAHUA. Naica, July 21, 1938, two males, four females. TAMAULIPAS. Forlon, September 30, 1938, two males. SAN LUIS POTOSI. Huichihuayan, July 27, 1938, one male. MORELOS. Cuernavaca, August 3, 1938, one male. GUERRERO. Tierra Colorada, August 15, 1938, six males, four females. JALISCO. Union de Tula, September 6, 1938, one male.

123. *Eurema* (*Pyrisitia*) *proterpia proterpia* (Fabricius).
SAN LUIS POTOSI. Huichihuayan, September 25, 1938, two males. TAMAULIPAS. Forlon, September 30, 1938, one male, one female; ten miles south Ciudad Victoria, July 25, 1938, one male. MORELOS. Cuernavaca, August 3, 1938, one male, one female. GUERRERO. Acapulco, August 16-30, 1938, one male; Tierra Colorada, August 25, 1938, one male, one female. JALISCO. Cocula, September 17, 1938, five males; Union de Tula, September 16, 1938, three males. CAMPECHE. Ciudad del Carmen, September 1-7, 1936, two males, one female.

124. *Eurema* (*Pyrisitia*) *dina westwoodi* (Boisduval).
SAN LUIS POTOSI. Huichihuayan, September 25, 1938, three males.

125. *Eurema* (*Pyrisitia*) *lisa lisa* (Bdv. & Lec.).
TAMAULIPAS. Forlon, September 30, 1938, one male. GUERRERO. Acapulco, August 16-30, 1938, one female. JALISCO. Cocula, September 17, 1938, one male. MORELOS. Cuautla, July 28, 1938, one male. CAMPECHE. Ciudad del Carmen, September 1-7, 1936, two males, one female.
The single female from Acapulco is of the albinic form *alba* Strecker.

126. *Eurema* (*Pyrisitia*) *nise perimede* (Prittwitz).
TAMAULIPAS. Forlon, September 30, 1938, one male.

127. *Nathalis iole* (Bdv.).
HIDALGO. Aqua Fria, September 24, 1938, one male.

PIERINAE

128. *Leptophobia aripa* (Boisduval).
SAN LUIS POTOSI. Huichihuayan, September 25, 1938, one male.

129. *Ascia* (*Ascia*) *monuste monuste* (Linnaeus).
GUERRERO. Acapulco, August 16-30, 1938, two males. CAMPECHE. Hacienda Balchakaj, Rio Chumpan, September 11, 1936, two males, one female.

130. *Ascia* (*Ganyra*) *amaryllis josepha* (Godman & Salvin).
CAMPECHE. Hacienda Balchakaj, Rio Chumpan, September 11, 1936, one male.

131. *Melete isandra* (Boisduval).
SAN LUIS POTOSI. Huichihuayan, September 25, 1938, one male.

PAPILIONIDAE

132. *Battus montezuma* (Westwood).
SAN LUIS POTOSI. Huichihuayan, July 27, 1938, one male; September 27, 1938, one specimen. MORELOS. Cuautla, July 28, 1938, one specimen.

133. *Battus philenor philenor* (Linnaeus).
SAN LUIS POTOSI. Huichihuayan, September 27, 1938.

134. *Battus polydamus polydamus* (Linnaeus).
JALISCO. Cocula, September 14, 1938.

135. *Papilio ajax ajax* Linnaeus.
GUERRERO. Tierra Colorada, August 15, 1938, two males. JALISCO. Cocula, September 14, 1938, one male; Tecolotlan, September 4, 1938, one male.
The specimens from Cocula and Tecolotlan are of the form *ampliata* Men. Those from Tierra Colorada are of the aberration or form *ehrmanni* Ehr.
136. *Papilio thoas autocles* Rothschild & Jordan.
SAN LUIS POTOSI. Huichihuayan, September 25, 1938, two specimens. CAMPECHE. Hacienda Balchakaj, Rio Chumpan, September 11, 1936, one male.
137. *Papilio cresphontes* Cramer.
CAMPECHE. Hacienda Balchakaj, Rio Chumpan, September 11, 1936, one female.
138. *Papilio pharnaces* Doubl.
MORELOS. Cuernavaca, August 6, 1938.
139. *Papilio garamas garamas* Hübner.
MORELOS. Cuernavaca, August 3, 1938.
140. *Iphiclides phaon* Boisduval.
SAN LUIS POTOSI. Huichihuayan, September 27, 1938.
This specimen is an example of the form *pharax* Godman & Salvin. It has hithertofore been recorded only from British Honduras.
141. *Iphiclides thymbraeus aconophos* (Gray).
GUERRERO. Acapulco, August 23, 1938. JALISCO. Cocula, September 14, 1938.
142. *Iphiclides epidaus tepicus* (Rothschild & Jordan).
JALISCO. Cocula, September 14, 1938, one male.
143. *Iphiclides epidaus fenochionis* (Godman & Salvin).
GUERRERO. Tierra Colorada, August 15, 1938, two males.
144. *Iphiclides agesilaus fortis* (Rothschild & Jordan).
GUERRERO. Tierra Colorada, August 15, 1938, sixteen males.

HESPERIOIDEA

HESPERIIDAE

PYRRHOPYGINAE

145. *Apyrrothrix araxes araxes* (Hewitson).
JALISCO. Tecolotlan, September 11, 1938, one male.
146. *Amenis affinis* (H.-S.).
GUERRERO. Acapulco, August 16-30, 1938, one female.

PYRGINAE

147. *Epargyreus exadeus* (Cramer).
GUERRERO. Acapulco, August 16-30, 1938, one male, one female. SAN LUIS POTOSI. Huichihuayan, September 25, 1938, one male.
148. *Phocides belus* Godman & Salvin.
CAMPECHE. Hacienda Balchakaj, Rio Chumpan, September 11, 1936, one female.
149. *Urbanus proteus* (Linn.).
GUERRERO. Tierra Colorada, August 15, 1938, three females.

150. *Urbanus dorantes* (Stoll).
GUERRERO. Tierra Colorada, August 15, 1938, two males, two females. MORELOS. Cuautla, July 28, 1938, one male.

151. *Urbanus simplicius* (Stoll).
SAN LUIS POTOSI. Huichihuayan, September 25, 1938, one male. MORELOS. Cuautla, July 28, 1938, one male. GUERRERO. Tierra Colorada. August 15, 1938, one male.

152. *Urbanus eurycles* (Latreille).
GUERRERO. Tierra Colorada, August 15, 1938, one female.

153. *Urbanus undulatus* (Hewit.).
GUERRERO. Acapulco, August 16-30, 1938, one male.

154. *Chioides albofasciatus* (Hewit.).
MORELOS. Cuautla, July 28, 1938, two females.

155. *Codatractus melon melon* (Godman & Salvin).
JALISCO. Union de Tula, September 6, 1938, one male, one female.

156. *Telegonus cretcus hopfferi* Plötz.
SAN LUIS POTOSI. Huichihuayan, September 25, 1938, one female.

157. *Telemiades megallus* Mab.
SAN LUIS POTOSI. Huichihuayan, September 25, 1938, one female.
Known before only from Panama.

158. *Autochton cunus* (Fabricius).
SAN LUIS POTOSI. Huichihuayan, September 25, 1938, one male; ten miles south Huichihuayan, September 25, 1938, one male.

159. *Autochton pseudocellus* (Cool.).
MORELOS. Seven miles north of Cuernavaca, August 3, 1938, one female.
This species was described from Arizona. It is a new record for Mexico.

160. *Cogia calchas* (Herrich-Schaeffer).
GUERRERO. Tierra Colorada, August 15, 1938, one male; Acapulco, August 16-30, 1938, one male.

161. *Pyrgus syrichtus syrichtus* (Fabr.).
GUERRERO. Acapulco, August 16-30, 1938, two males.

162. *Pyrgus philetas* (Edw.).
JALISCO. Cocula, September 17, 1938, one male.

163. *Pyrgus communis albescens* Plötz.
JALISCO. Chapala, September 11, 1938, one male, one female. GUERRERO. Acapulco, August 16-30, one male, one female.

164. *Heliopetes arsalte* (Linnaeus).
CAMPECHE. Hacienda Balchakaj, Rio Chumpan, September 11, 1938 one male.

165. *Heliopetes macaira* (Reakirt).
JALISCO. Chapala, September 11, 1938, one male.
This specimen is of the form *nivella* Mab.

166. *Antigonus emorsa* Felder.
MORELOS. Cuernavaca, August 3, 1938, one male. GUERRERO. Tierra Colorada, one male.
These two males are of the light colored form *albimedia* Draudt.

167. *Antigonus erosa* Hübner.
SAN LUIS POTOSI. Huichihuayan, July 27, 1938, one female; September 25, 1938, one male. GUERRERO. Tierra Colorada. August 15, 1938, two males.

168. *Pholisora catullus* (Fabricius).
CHIHUAHUA. Chihuahua, July 14, 1938, one female.
169. *Pholisora mejicanus* (Reakirt).
MORELOS. Cuernavaca, August 3, 1938, one male. JALISCO. Chapala, September 11, 1938, one female.
170. *Pholisora* sp. (related to *ecos* Edw.).
JALISCO. Cocula, September 17, 1938, one male.
171. *Pholisora* sp. (close to *evippe* Godman & Salvin).
MORELOS. Cuernavaca, August 3, 1938, one male, one female.
172. *Achlyodes pallida* (Felder).
MICHOACAN. Nr. Uruapan, September 18, 1936, one female.
173. *Pellicia bromias* Godman & Salvin.
SAN LUIS POTOSI. Huichihuayan, September 25, 1938, one male.
174. *Erynnis funeralis* (Scudder & Burgess).
MORELOS. Cuatla, July 28, 1938, one female.

HESPERIINAE

GROUP A

175. *Pamphilida dardaris* Godman & Salvin.
JALISCO. Cocula, September 17, 1938, one male, one female; Union de Tula, September 6, 1938, five males, one female. MORELOS. Cuernavaca, August 3, 1938, one male. GUERRERO. Tierra Colorada, August 15, 1938, one male.
176. *Butleria microsticta* Godman & Salvin.
MORELOS. Cuernavaca, August 3, 1938, one male.
177. *Butleria penaea* Dyar.
JALISCO. Cocula, September 17, 1938, one male; Union de Tula, September 6, 1938, one male.
178. *Butleria jaula* Godman & Salvin.
JALISCO. Union de Tula, September 6, 1938, two males.

GROUP B

179. *Ancyloxypha arene* (Edw.).
JALISCO. Cojumatlan, September 9, 1938, one male.
180. *Copaeodes minima* (Edwards).
JALISCO. Cojumatlan, September 9, 1938, one male.

GROUP C

181. *Yvretta citrus* (Mab.).
SAN LUIS POTOSI. Huichihuayan, September 25, 1938, one male. GUERRERO. Acapulco, August 16-30, one male.
The male from Acapulco is much darker underneath than the male from Huichihuayan.
182. *Yvretta carus* (Edw.).
GUERRERO. Tierra Colorada, August 15, 1938, one male, one female
183. *Hylephila phylaeus* (Drury).
GUERRERO. Tierra Colorada, August 15, 1938, seven males, one female.
184. *Atalopedes campestris* (Boisduval).
MORELOS. Cuautla, July 28, 1938, one male.

185. *Polites vibex* (Geyer).
MORELOS. Cuernavaca, August 3, 1938, one male.

186. *Polites athenion* (Hübner).
GUERRERO. Tierra Colorada, August 15, 1938, two males, one female; Acapulco, August 16-30, 1938, one female.

187. *Cobalus cannae* Herrish-Schäffer.
MORELOS. Cuernavaca, August 3, 1938, two males.

188. *Lerodea neamathla* Skinner & Williams.
JALISCO. Cocula, September 17, 1938, one male. Not before recorded south of Texas.

GROUP D

189. *Panoquina nyctelius* (Latreille).
SAN LUIS POTOSI. Huichihuayan, September 25, 1938, one male, female.

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Errata in Two Recent Papers on Taphrina

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IN TWO recent papers by the writer on the genus *Taphrina* (The Genus Taphrina: I. An Annotated Bibliography, University of Kansas Science Bulletin 24:9:113-149. II. A List of Valid Species, Ibid 9:151-176:1936) certain errors and omissions occur.

Another reference should have been included in the bibliography: Lind, J. Danish Fungi as represented in the herbarium of E. Rostrup. Copenhagen, 1913. Lists the species of Taphrina known in Denmark.

In the species list, an additional host, *Polystichum acrostichoides* (Michx.) Schott, should have been given for *Taphrina filicina* Rostr. This is an omission only because these papers are compilations from the literature and present no new information concerning species of *Taphrina*. Actually the fungus on Christmas fern is not *Taphrina filicina*, but *Taphrina Polystichi* Mix.* Another host, *Prunus nigra* Ait., should be added for *T. communis* (Sadeb.) Giesenhag.

Certain undescribed species mentioned in the bibliography are not included in the species list. Three species: *Taphrina Blechni* on *Blechnum sp.*, *T. Selaginellae* on *Selaginella Menziesii*, and *T. Fagi* on *Fagus* sp., are not mentioned in either paper. The only reference to these fungi that has been found is their mention (without author-citations) by Laubert in the latest edition of Sorauer's Handbuch der Pflanzenkrankheiten. Presumably the names and descriptions are to be found with herbarium specimens accessible to Laubert.

Number 30 in the species list, "*Taphrina alni-incanae* (Kühn) Magn." should by strict adherence to the principle of priority be called *Taphrina amentorum* (Sadeb.) Rostr.

* Mix, A. J. Species of Taphrina on North American Ferns. Mycologia 30:5:563-579. 1938.

In paper I: page 121, citation 46, "Queseus" should read "Quercus"; page 124, citation 56, "Johansen, C. L." should read "Johanson, C. J."; page 126, citation 63, "Queseus" should read "Quereus"; citation 64, the date 1896 should be "1886"; page 132, citation 86, "Meechan" should read "Mechan"; page 140, citation 131, "*Taphrina theobromae* Fab." should be "*Taphrina bussei* Fab." In paper II, page 161, under species 41, "*B. ordorata*" should read "*B. odorata*"; page 168, under species 70a, "your" should read "young"; page 175, under species 101, "*Exoascus sebastinae*" should be "*Exoascus sebastianae*."

Since these two papers are, as stated earlier, compilations from the literature, questions of priority are not likely to arise. Nevertheless it seems proper to mention that in spite of the date which they bear, July 15, 1936, they did not actually appear in print until February, 1938.

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Morphological Differences in Taphrina Caerulescens Upon Different Species of Quercus

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ABSTRACT: The range of size of the asci of *Taphrina caerulescens* (Desm.) Tul. should be extended from 40-80μ × 15-25μ as given in the literature to 30-120μ × 11-34μ as shown by a study of a large number of infected host species.

The form of the asci of *T. caerulescens* varies upon different hosts, as does also their manner of insertion between the epidermal cells. The bases of many of the asci show well-developed rhizoidal appendages while upon others the bases are blunt or merely tapered.

Taphrina rubrobrunnea (Pk.) Sacc. is similar in its morphology to *Taphrina caerulescens* (Desm.) Tul. and is therefore referred to that species.

Since *Taphrina Kruchii* (Vuill.) Sacc. is reported to produce witches' brooms and geotropic curvature of the twigs of its host, it should be retained as a separate species, although its asci are similar in form to those of *T. caerulescens*.

Some evidences of biological specialization of *Taphrina caerulescens* have been observed. Further investigation of such specialization by means of cross-inoculation experiments is desirable.

PREVIOUS studies of *Taphrina caerulescens* (Desm.) Tul. have been concerned with the effects of the fungus on the host, the dimensions of the asci and spores and, to some extent, with the shape of the asci and their manner of insertion in the host tissue. Little attention has been given to differences in the morphology of the asci on different host species.

Ascomyces caerulescens Desm. and Mont. was described by Desmaziéres (1) as having no mycelium, the "sporangium" constituting the entire fungus. Sporangia (asci) were cylindrical, obtuse at the apex, 1/20 mm. (50μ) long and 1/60 mm. (16.6μ) thick. This new genus *Ascomyces* was not clearly distinguished from the existing

genus *Taphrina,* and *A. caerulescens* was therefore renamed *Taphrina caerulescens* by Tulasne (15).

Ascomyces alutaceus Thm. was described by von Thümen (14) from the leaves of *Quercus pubescens* Willd., as having broadly cylindrical or nearly oblong asci, narrowed at the base, obtusely truncate at the top, 28-36 mm. long and 20 mm. broad. (Presumably microns were meant rather than millimeters.) Saccardo (11) emended the description of *A. alutaceus* from the leaves of *Quercus robur* L., giving as measurements for the asci: length, 35-40μ; breadth, 20μ. This fungus was reduced to synonymy by Giesenhagen (3), becoming *Taphrina caerulescens* (Desm. and Mont.) Tul.

Taphrina caerulescens was again described from leaves of *Quercus pubescens* Willd. by Sadebeck (12). His measurements for the asci were: 55-70μ × 15-20μ. Sadebeck observed that the asci sometimes penetrated between epidermal cells as much as 25μ if the bases of the asci were much narrowed, or only about 10μ if the bases were relatively blunt.

The measurements given by Peck (8) for the asci of *Ascomyces extensus* Pk. on leaves of *Quercus macrocarpa* Michx. were: .002-.0025 in. (50-62.5μ) long, .0009-.0011 in. (22.5-27.5μ) broad. This fungus was referred to *Taphrina caerulescens* by Farlow (2).

Peck (9) also described as new, *Ascomyces rubrobrunneus* Pk. from the leaves of *Quercus rubra* L. The asci were oblong, truncate at the apex, .002-.003 in. (50-75μ) long by .0006-.0009 in. (15-22.5μ) broad. Peck distinguished this fungus from *Ascomyces alutaceus* Thm. by the color of the spots, larger asci and different shape of the spores, and it has never been reduced to synonymy.

Kruch (6) reported a new species of *Taphrina* which caused witches' brooms, swelling and geotropic curvature of twigs, of *Quercus Ilex* L. This fungus was described as *Exoascus Kruchii* by Vuillemin (17), who found that it differed from *Taphrina caerulescens* in the dimensions of the asci and in that the hymenium covered the whole lower surface of the leaf. According to Vuillemin, the asci of *E. kruchii* are 72-80μ long, 21-23μ broad, and have a footlike base inserted beneath the cuticle. The protruding portion is narrowed into a neck at the point of emergence and the ascus is swollen slightly at the tip. Sadebeck (13) and Giesenhagen (3) reported the measurements of the asci of *Taphrina Kruchii* (Vuill.) Sacc. as 65-75μ × 15-20μ, broadened at the base to 30-40μ. Sadebeck also observed "haustorium-like projections" into the tissue.

Patterson (7) had available for her studies specimens of *Taphrina*

caerulescens on *Quercus velutina* Lam., *Q. rubra* L., *Q. alba* L., *Q. coccinea* Muench., *Q. phellos* L., *Q. Douglasii* Hook. and Arn., *Q. nigra* L. and *Q. laurifolia* Michx. She found the asci often amphigenous, rounded at the apex, 40-80μ × 15-25μ. One or more processes extended in between the epidermal cells for 10-20μ, the longer processes were two or three to an ascus, the shorter and blunt processes one to an ascus. Presumably this description was made from a study of the fungus on a number of the hosts mentioned above. Patterson's figure of *T. caerulescens* as occurring on *Quercus phellos* L. shows asci with bases somewhat tapered and projecting between the epidermal cells.

Giesenhagen (3) illustrated an ascus of *Taphrina caerulescens* with a tapered base, and gave measurements of the asci as 55-70μ × 18-24μ.

Jaczewski (4) distinguished a variety of *T. caerulescens* on *Quercus coccifera* L. The asci of this fungus, *Taphrina caerulescens* var. *Quercus-coccifera* lacked rhizoids, and were seated on the epidermis.

Jankowska (5) found asci of *T. caerulescens* on various hosts to be of two types: (1) clavate asci, gradually narrowed to a point at the base and inserted, and (2) cylindrical asci, sessile by a broad base. Jankowska reported the size of asci as 55-80μ × 18-24μ.

The studies[1] to be reported here are concerned with the morphology of the asci of *Taphrina caerulescens* on thirty-six different species of *Quercus*. The list of host species is undoubtedly not complete, but it is sufficiently long to indicate the variability of the fungus from host to host. The nomenclature followed for the American oaks is that of Trelease (16) and for foreign oaks of Rehder (10) or of Index Kewensis.

In table 1 is presented a compilation of the measurements of the asci of *T. caerulescens* on the different species of oaks studied.

From this table it may be seen that the asci of *Taphrina caerulescens* on the different species of oaks vary in size from 30μ to 120μ in length, and from 11μ to 34μ in width. The largest asci were found on *Quercus geminata, Q. coccinea* and *Q. Douglasii,* and some of the smallest on *Q. Cerris, Q. macrocarpa,* and *Q. undulata.*

In addition to differences in size, much variation occurs in the form of the asci on the different species of oaks. In general, they

1. Grateful acknowledgement is hereby made to Dr. A. J. Mix for suggesting this problem, for advice and encouragement throughout, and for the use of material. Specimens have also been received from various localities in the United States, Canada, Europe, Asia and Africa. Space does not permit separate acknowledgment to the many contributors who have so generously made these studies possible.

TABLE I

Dimensions in microns of the asci of *T. caerulescens* Upon Different Species of *Quercus*

Host Species.	Dimensions of asci.	Number of specimens examined.
Quercus acutissima Carruth	50– 92 × 15–27	2
agrifolia Née	46– 68 × 15–19	1
alba L.	49–103 × 15–34	3
borealis Michx F.	46– 76 × 15–30	1
Cerris L.	30– 72 × 11–23	3
cinerea Michx.	42– 68 × 15–23	1
coccifera L.	46– 84 × 11–27	4
coccinea Muench.	68–118 × 13–30	1
crispula Blume	46– 92 × 14–23	1
dentata Thunb.	57– 84 × 13–22	2
Douglasii Hook. and Arn.	65–118 × 19–28	1
ellipsoidalis Hill.	57–104 × 15–30	1
fruticosa Brot.	38– 65 × 11–19	1
geminata Small	75–120 × 15–27	1
georgiana Curtis	49– 84 × 19–30	1
ilicifolia Wangh.	46– 84 × 15–27	2
imbricaria Michx.	49– 91 × 11–30	3
Kelloggii Newb.	65–106 × 19–27	1
lanuginosa Thuill.	53– 84 × 15–27	2
laurifolia Michx.	57– 95 × 15–27	2
lobata Née	50– 87 × 17–23	1
macrocarpa Michx.	38– 76 × 15–27	3
marilandica Muench.	53–103 × 11–26	2
maxima Ashe	46– 95 × 13–30	5
Mirbeckii Durieu	46– 84 × 19–27	1
nigra L.	65– 95 × 19–34	2
palustris Muench.	54– 84 × 19–27	1
phellos L.	46– 76 × 11–19	1
rubra L.	57– 99 × 17–25	1
robur L.	50– 84 × 19–25	1
serrata Thunb.	64– 92 × 18–30	1
sessiliflora Salisb.	46– 72 × 15–27	2
stellata Wangh.	57– 80 × 15–27	1
undulata Torr.	38– 84 × 15–27	2
velutina Lam.	49– 95 × 15–27	7
virginiana Miller	68– 95 × 15–23	2

are cylindrical or club-shaped and somewhat flattened at the apex. Frequently they are slightly constricted at the point of emergence from the host tissue. The bases of the asci may be seated on the epidermal cells of the host or somewhat inserted between them.

Commonly the bases of the asci are gradually tapered and thus wedged closely between adjacent cells of the host epidermis (Plate XXXIX, *Q. geminata* through *Q. fruticosa*). The asci formed on *Quercus Kelloggii* or on *Q. alba* are blunt or slightly rounded at the base. On certain hosts the asci have deeply inserted projections

which may clasp the epidermal cells of the host. The asci on *Q. borealis* and on *Q. Cerris* very frequently show such rhizoidal elongations (Plate XXXIX).

The asci formed upon any one host species are rather constant in size and shape. This became especially evident in those cases (*Q. maxima, Q. velutina*) in which study was made of several specimens collected at different times and in different places. They may, however, be variable with regard to the form of the base and its manner of insertion.

In Plates XXXVIII and XXXIX an attempt has been made to show differences in both size and morphology for all forms studied. In these figures each ascus has been drawn median size, as expressed by the measurements in Table I. In addition bases of asci have been shown for each form, representing every type of ascus base seen on each host species.

With respect to the form of the base and the manner of insertion in the host tissue, it is possible to recognize two host groups. The following oaks usually show asci with one or more rhizoidal projections: *Quercus acutissima, Q. borealis, Q. Cerris, Q. coccifera, Q. coccinea, Q. ellipsoidalis, Q. georgiana, Q. ilicifolia, Q. imbricaria, Q. lanuginosa, Q. macrocarpa, Q. marilandica, Q. maxima, Q. Mirbeckii, Q. nigra, Q. palustris,* and *Q. velutina.* The occurrence of rhizoids in the fungus on *Q. coccifera* seems to invalidate the description by Jaczewski (4) of a variety on this host.

The host species upon which the asci are usually flattened, or merely tapered for close insertion between the epidermal cells are: *Quercus alba, Q. cinerea, Q. fruticosa, Q. geminata, Q. dentata, Q. Kelloggii, Q. laurifolia, Q. phellos, Q. robur, Q. sessiliflora Q. stellata, Q. undulata,* and *Q. virginiana.*

When, however, size-differences in the asci are taken into account as well as the type of ascus base, it is no longer possible to divide the forms studied into two well-defined groups. In fact if an attempt were made to divide *Taphrina caerulescens* into subspecies or varieties on the basis of ascus morphology, a separate category would need to be made for nearly every host species.

At present, little can be reported concerning the extent of biological specialization among forms of *Taphrina caerulescens.* That such specialization may exist is evidenced by the following observations: A. J. Mix[2] found in 1937, near Camdenton, Mo., a single heavily infected tree of *Quercus velutina* standing in a thicket of young trees of *Q. macrocarpa* all of them entirely free from the disease. R. H.

Thompson[2] has frequently seen, in the vicinity of Amherst, Mass., badly infected trees of *Q. maxima* growing near uninfected trees of *Q. alba*. Specimens were received in 1938, from Dr. E. A. Bessey with note enclosed calling attention to scant infection of *Q. coccinea* and abundant infection of *Q. borealis* Michx. in the same locality (Huron county, Michigan). Dr. H. N. Hansen has observed[3] that in a garden at Saratoga, Cal., a tree of *Q. Kelloggii* bore numerous infections, while a tree of *Q. lobata* with intermingling branches showed none, and a tree of *Q. agrifolia* growing about twenty-five feet away was also free of infection. That these species are susceptible to forms of the fungus in other localities is apparent from the numerous infected specimens received.

H. H. Wedgworth (18) reported that in Mississippi in 1926 *Taphrina caerulescens* attacked nearly all species of oaks, being most severe on *Quercus nigra* L. and *Q. rubra* L., while *Q. phellos* L. showed marked resistance.

Since *Taphrina caerulescens* does not occur in the vicinity of Lawrence, Kan., the nearest known station being fifteen miles distant, oaks growing out of doors at Lawrence can be inoculated without danger of infection from natural sources. Accordingly, in early spring, 1937, several trees of three species: *Q. macrocarpa, Q. palustris,* and *Q. Muhlenbergii* were inoculated with cultures of *T. caerulescens* from the following hosts: *Quercus marilandica, Q. maxima, Q. virginiana, Q. velutina, Q. laurifolia, Q. Kelloggii.* No infection resulted, presumably because no rain ensued until after the leaves were out and well grown. Further cross-inoculation experiments would be very desirable.

In addition to the forms recognized as belonging to *Taphrina caerulescens,* two other fungi which have been considered to be separate species have been studied: *Taphrina rubrobrunnea* (Pk.) Sacc. and *T. Kruchii* (Vuill.) Sacc. Type material of *T. rubrobrunnea* upon *Quercus maxima* Ashe was examined. The asci were found to agree closely in size and shape with those of *Taphrina caerulescens* upon the same host. Obviously this species is synonymous with, and is here referred to *Taphrina caerulescens* (Desm.) Tul.

Examination of a leaf fragment of *Quercus Ilex* L. infected with *Taphrina Kruchii,* showed the whole lower surface covered with asci.

2. Reported in personal conversation with the writer.

3. Reported in a letter from Dr. H. Earl Thomas. In personal conversation Doctor Hansen expressed the opinion that leaves of *Q. agrifolia* (an evergreen oak) may not have been susceptible at the time leaves of *Q. Kelloggii* became infected.

In size and shape the asci were similar to those of *T. caerulescens*. However, *T. Kruchii* should, for the present, at least, be retained as a separate species since, according to Kruch (6), it produces witches' brooms, deformation and geotrophic curvature of the twigs of its host.

The morphology of the ascus, including size, shape, and presence or absence of a stalk cell, has always been the basis of species-differentiation within the genus *Taphrina*. It would be perfectly possible to divide *Taphrina caerulescens* into a number of new species on ascus size and shape. For example, the fungus on *Quercus borealis* and that on *Q. Kelloggii* are widely different, and the treatment of them as separate species would be quite in line with the procedure of various mycologists in describing different species of *Taphrina* on different species of such host genera as *Betula* and *Prunus*. The first of these "new species" might easily include also the fungi on *Quercus Cerris* and *Q. macrocarpa*. If, however, the forms on *Q. lanuginosa* and *Q. ilicifolia* were added a good beginning would have been made toward including all or nearly all of the forms here illustrated in one species, which, of course, would be *T. caerulescens*. The alternative would be to erect a new species for each new host species. Such a procedure is, of course, undesirable, in fact any subdivision of the existing species should not be attempted until more is known of the biological peculiarities of *Taphrina caerulescens* on different species of oaks. The differences in morphology that have been observed point, however, to the great desirability of learning more about these biological relationships.

Taphrina caerulescens then, may be said to include those forms of *Taphrina* which affect the leaves only (not attacking twigs or causing witches' brooms) of many species of *Quercus,* producing definite spots or blisters, or occasionally deforming the entire leaf. The asci may be produced on either or both sides of the leaf. They may be cylindrical or club-shaped and vary in length from 30-120μ and in diameter from 11-34μ. Their means of insertion between the epidermal cells varies from a blunt, seated or slightly inserted base to deeply inserted bases with well-developed rhizoidal appendages. These appendages in some cases grow partially around the epidermal cells and so are firmly anchored to them. The ascospores are rarely seen, but the asci are filled with numerous small conidia.

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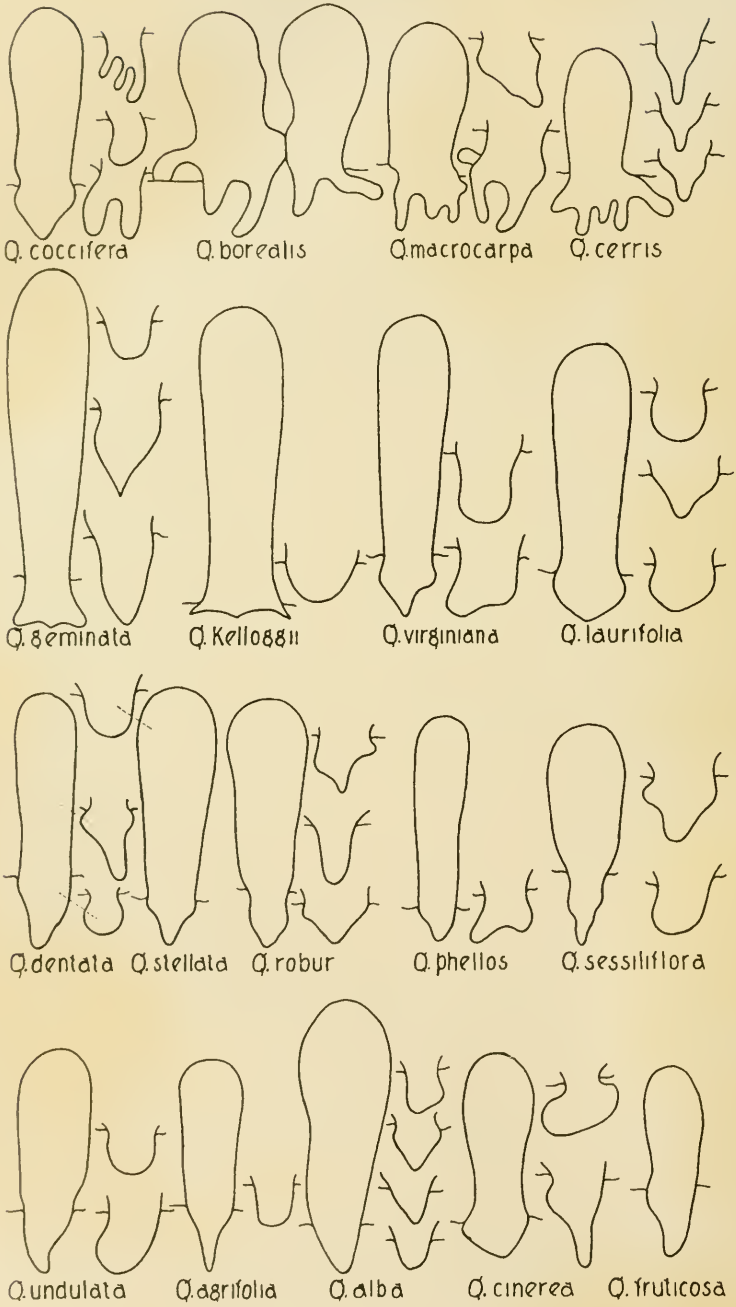
EXPLANATION OF PLATES

PLATE XXXVIII. Asci of *Taphrina caerulescens* on various species of *Quercus*. Each ascus is drawn median size (× 500), and various types of ascus-base are shown for each post-species.

PLATE XXXIX. Asci of *Taphrina caerulescens* on various species of *Quercus* (see legend for Plate XXVIII).

PLATE XXXVIII

PLATE XXXIX


Q. coccifera
Q. borealis
Q. macrocarpa
Q. cerris
Q. seminata
Q. Kelloggii
Q. virginiana
Q. laurifolia
Q. dentata
Q. stellata
Q. robur
Q. phellos
Q. sessiliflora
Q. undulata
Q. agrifolia
Q. alba
Q. cinerea
Q. fruticosa

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A New Synaptomys from the Pleistocene

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ABSTRACT: A new lemming, *Synaptomys bunkeri,* is described from the Pleistocene. The associated vertebrate fauna includes *Archidiskodon imperator* (Leidy), fragments of a small duck and fish. A list of associated invertebrate species is given.

INTRODUCTION

DURING the summer of 1937, while collecting on the XI Ranch in Meade county, Kansas, we secured a few vertebrate remains from a Pleistocene deposit. Among them is an apparently new *Synaptomys.* The geology of this section is being studied by Dr. H. T. U. Smith and will appear at an early date. For the new lemming I wish to propose the name:

Synaptomys bunkeri sp. nov.

Holotype. No. 4610, Kansas University Museum of Vertebrate Paleontology; right lower jaw, bearing M_1 and M_2. Collected by the Museum Field Party, July, 1937.

Horizon and type locality. Pleistocene, K. U. M. V. P. Locality No. 5, twenty-one miles south of Meade, Kan.

Diagnosis. Belongs to the subgenus *Synaptomys;* M_1, anterior loop with broadly confluent pair of triangles, with greatly reduced outer anterior salient angle; anterior enamel border of the second outer salient angle *in line with* the posterior enamel border of the third inner salient angle; M_2, with well developed second alternating triangle; larger than *Synaptomys cooperi gossi.*

Description of type. Teeth rootless; cement present in reëntrant folds; incisor passes completely lingual to molar series, but broken so

that the posterior termination is unknown; mental foramen normal in position but slightly larger than that of *Synaptomys cooperi gossi;* pit present between M_3 and coronoid process; two large foramina opposite outer border of M_2. M_1 consists of three outer and three inner salient angles, a posterior loop, three alternating closed triangles, the first and third are internal, the anterior loop is formed by a broadly confluent pair of triangles which greatly reduce the outer anterior salient angle. The apex of the second outer salient angle is nearly opposite the apex of the third inner salient angle, so that the anterior enamel border of the second outer salient angle is *in line with* the posterior enamel border of the third inner salient angle. While in *Synaptomys cooperi* the apex of the second outer salient angle meets the posterior enamel border of the third inner salient angle nearly at midpoint instead of nearly opposite its apex. Thus the anterior enamel border of the second outer salient angle of *S. cooperi* is not *in line with* the posterior enamel border of the third inner salient angle as in *Synaptomys bunkeri.* The second alternating closed triangle is truncated. M_2, with two outer and two inner salient angles, posterior transverse loop and three alternating closed triangles; the second alternating triangle well developed; apex of the second outer salient angle opposite the apex of the second inner salient angle. Anteroposterior diameter of M_1, 2.8 mm., anteroposterior diameter of M_2, 2.2 mm. The dentition of *Synaptomys bunkeri* is heavier than that of *S. cooperi.* The lower teeth having a slightly greater anteroposterior and transverse diameter, also the entire jaw is slightly larger and more heavily built.

Remarks. Synaptomys bunkeri is distinguished from the fossil form, *Synaptomys australis* Simpson, by its smaller size. *Synaptomys annexus* (Peterson) and *Synaptomys vetus* Wilson belong to the subgenus *Mictomys* and therefore need no comparison. In size the new form corresponds rather closely to *Synaptomys cooperi gossi* (Coues); it is distinguished by a heavier dentition and by the pattern of M_1. A series of dentition patterns of *Synaptomys c. gossi* are figured showing the range of variation in the recent form studied. I am indebted to Mr. Gerrit S. Miller, Jr., of the United States National Museum for the loan of specimens and permission to figure them. Figures 2 and 3 represent the extreme end of variation in a series of over 150 individuals of *Synaptomys c. gossi* studied which are nearest to *Synaptomys bunkeri* in pattern. These were the only two found representing any approach to the fossil form. The figures are arranged in a series to show the entire variation in dentition

pattern encountered while studying the recent form. The series does not represent a true variation due to wear; for if it is noted, it will be seen that the series represents all ages and sexes arranged in any order to show the extremes of dentition pattern. Figures 6, 7 and 8 represent over ninety percent of the dentition patterns observed in adult specimens.

This species is named for Mr. C. D. Bunker, Curator of Birds and Mammals, who made possible a combined field trip with the Museum of Vertebrate Paleontology during the summer of 1936, at which time were located the Meade county fossil deposits.

Associated fauna. The vertebrate remains were taken from a zone of clay in which occurred an abundance of invertebrates. I am indebted to Dr. Frank C. Baker for the identification of the invertebrates, with the exception of the *Physa*, which were identified by Dr. W. J. Clench. The associated invertebrates are as follows: *Succinea grosvenori* Lea, common; *Stagnicola caperata* (Say), rare; *Gyraulus altissimus* (Baker), common; *Physa anatina* Lea, very abundant; *Physa hawnii* Lea, very abundant; *Helisoma trivolvis lentum* (Say), very abundant.

Doctor Baker makes the following comment on the deposit, "It is predominantly a fresh water one, the few land shells have been washed in by rain (or otherwise). All the freshwater species are pulmonates, no water breathers being present. This would indicate that the body of water was not very deep. It might have been a sluggish river."

In the deposit was found fragmentary fish material; the distal end of an ulna (No. 4612 K. U. M. V. P.) belonging to a small-sized duck (identified by Dr. A. Wetmore) and two associated upper molars (No. 4636 K. U. M. V. P.) of *Archidiskodon imperator* (Leidy).

MARINE BIOLOGICAL LABORATORY LIBRARY WOODS HOLE MASS.

PLATE XL

FIG. 1. *Synaptomys bunkeri* Hibbard, holotype, No. 4610 K. U. M. V. P.; diagram of enamel pattern of right M_1 and M_2. $\times$ 10.

FIG. 2. *Synaptomys cooperi gossi* (Coues), K. U. No. 4626; diagram of enamel pattern of right M_1 and M_2 of old adult ♂. $\times$ 10.

FIG. 3. *Synaptomys cooperi gossi* (Coues), U. S. N. M. No. 254163; diagram of enamel pattern of right M_1 and M_2 of adult. $\times$ 10.

FIG. 4. *Synaptomys cooperi gossi* (Coues), U. S. N. M. No. 101386; diagram of enamel pattern of right M_1 and M_2 of immature. $\times$ 10.

FIG. 5. *Synaptomys cooperi gossi* (Coues), U. S. N. M. No. 190363; diagram of enamel pattern of right M_1 and M_2 of young adult. $\times$ 10.

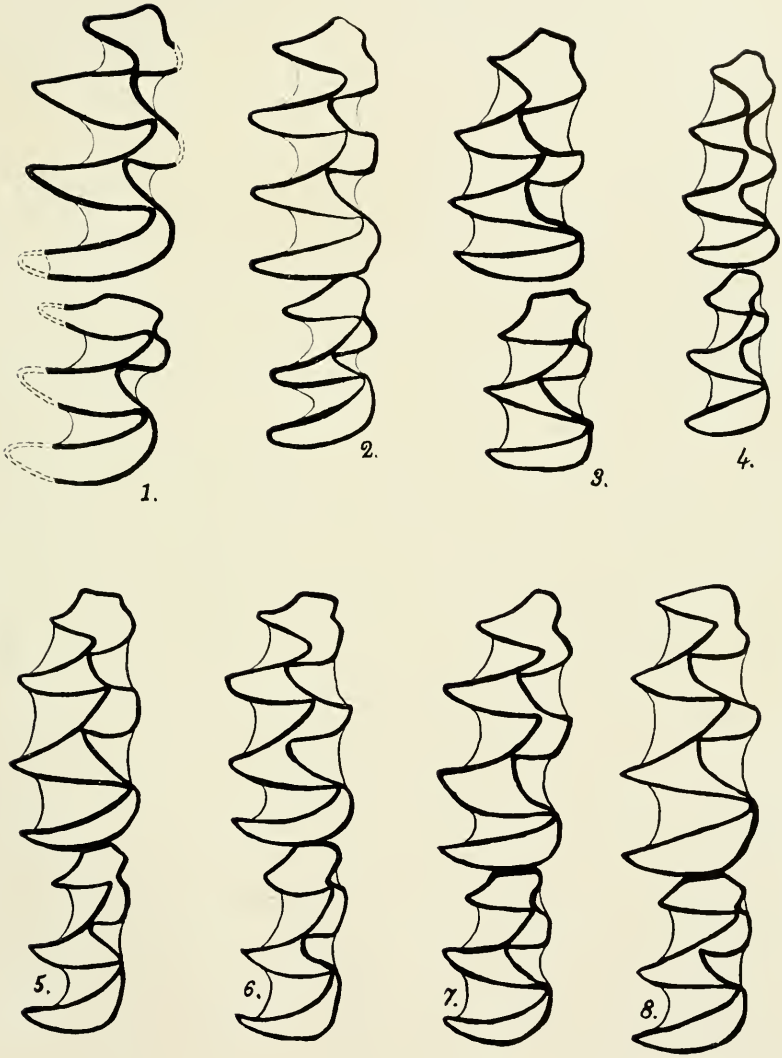
FIG. 6. *Synaptomys cooperi gossi* (Coues), K. U. No. 4710; diagram of enamel pattern of right M_1 and M_2 of adult ♀. $\times$ 10.

FIG. 7. *Synaptomys cooperi gossi* (Coues), K. U. No. 4735; diagram of enamel pattern of right M_1 and M_2 of adult ♂. $\times$ 10.

FIG. 8. *Synaptomys cooperi gossi* (Coues), K. U. No. 5030; diagram of enamel pattern of right M_1 and M_2 of adult ♀. $\times$ 10.

All drawings were made by Miss Frances B. Watson excepting figures 1 and 2, which were drawn by Walter Yost.

PLATE XL



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A New Pycnodont Fish from the Upper Cretaceous of Russell County, Kansas

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ABSTRACT.—A new Pycnodont fish, *Coelodus streckeri* sp. nov. is described from the Upper Cretaceous of Kansas. The type is based on a nearly complete prevomer with teeth.

MR. H. D. O'BRIEN, of Russell, Kan., recently sent to the museum for identification, a nearly complete prevomer of a Pycnodont fish collected by Mr. Ernest Strecker, of Paradise, Kan. Mr. Strecker has kindly donated the specimen to the museum since it represents apparently an undescribed species of the genus *Coelodus*. This is the first remains of a Pycnodont fish to be found in the Upper Cretaceous of Kansas.

Coelodus streckeri sp. nov.

(Plate XLI, figs. 1 and 2)

Holotype. No. 946F, Kansas University, Museum of Vertebrate Paleontology. Prevomer plate nearly complete. Collected by Ernest Strecker, July 1, 1938.

Horizon and type locality. Carlile Shale, Upper Cretaceous, two and one-half miles south and one-half mile east of Paradise, Russell county (locality No. 31), Kansas.

Diagnosis. Size, large, median teeth elipsoid, posterior surface not concave.

Description of type. Prevomer larger than that of *Coelodus gyrodoides* Egerton. Five longitudinal rows of acrodont teeth. The internal lateral rows longer than the median row. Greatest width of dentitional series 44.9 mm. The anterior portion of the prevomer

missing. The left outer row of lateral teeth are 8 in number, measuring 55.2 mm., while those of the right side are 7 in number in both rows measuring 46 mm. and 51 mm., respectively. The teeth of the lateral rows are rounded in shape in the posterior part of the row, gradually becoming elipsoid as one passes anteriorly. The last two teeth in the anterior portion of the lateral rows are quadrangular in outline. The posterior border of all of the lateral teeth are convex. The teeth of the lateral rows have shallow apical depressions which are not wrinkled. The teeth of the median row are elipsoid, with shallow apical depression transversely placed with a tendency for a ridge to be developed along posterior border of apical depression. Crowns not wrinkled. The length of the median row of teeth is approximately 52 mm. The measurements of the teeth of the median row are taken from the posterior to the anterior; (first posterior tooth missing) second tooth, transverse width 12.4 mm., anteroposterior diameter 6.7 mm.; third tooth, transverse width 12.8 mm., anteroposterior diameter 6.7 mm.; fourth tooth, transverse width 11.5 mm., anteroposterior diameter 6.8 mm.; fifth tooth, transverse width 10.7 mm., anteroposterior diameter 6.2 mm.; sixth tooth, transverse width 9.5 mm., anteroposterior diameter 6.0 mm.; seventh tooth, transverse width 8.7 mm., anteroposterior diameter 5.7 mm.

The oral surface of the fused prevomer looking across the crowns of the teeth is strongly convex. On the superior side of the prevomer is a heavily developed median ridge. At the posterior end of the prevomer is a deep concavity.

The genus *Coelodus* has heretofore been known only from the Lower Cretaceous of Kansas, Oklahoma, and Texas in North America. The species known from Kansas is *Coelodus stantoni* Williston from the Kiowa shales, near Belvidere, Kiowa county, Kansas.

This species is named for Mr. Ernest Strecker, who collected and donated the specimen to the Museum of Vertebrate Paleontology.

PLATE XLI

FIG. 1. *Coelodus streckeri*, sp. nov., oral view of prevomer, holotype No. 946F, K. U. M. V. P. Approximately 3/2 natural size. See text for measurements and description.

FIG. 2. *Coelodus streckeri*, sp. nov. lateral view of left side of prevomer showing outer row of teeth, holotype No. 946F, K. U. M. V. P. Approximately 3/2 natural size. See text for measurements and description.

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The Dermestid Method of Cleaning Skeletons

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ABSTRACT: The dermestid beetle method of cleaning skeletons and skulls has been used in the University of Kansas Museum of Birds and Mammals for a number of years. Discussions of the procedure, the requisites of a bug room, the advantages of the method, and suggestions as to the successful utilization of the beetles are given.

FOR a number of years the University of Kansas Museum of Birds and Mammals has been using dermestid beetles very successfully in cleaning skeletons. The use of these beetles for this purpose was begun in this institution over twenty years ago. At that time the black carpet beetle *Attagenus piceus,* a dermestid, was such a museum pest that a student, Dix Teachenor, working on small bird skulls, attempted to protect his specimens by enclosing them in tin cans. Later Mr. C. D. Bunker, in charge of the University of Kansas Museum of Birds and Mammals, upon opening the beetle-proof containers, found these delicate skulls cleaned and completely intact, and the compartment quite active with dermestids. The skulls which had been so painstakingly enclosed had, unknown to Mr. Teachenor, already been infested with dermestid eggs.

For some time these small dermestids were used by Mr. Bunker for skeleton cleaning, which was done in a specially constructed bug room.

The custom of hanging carcasses out to dry led to the use of the larger dermestid *Dermestes vulpinus,* herein referred to as "bugs," which, enclosed in similar containers, did the work much more quickly.

The University of Kansas Museum is, however, still using the small black carpet beetle for skeletal cleaning which the larger

beetles refuse or fail to accomplish, for although they are much slower, they will eventually clean nearly any specimen

The University of Kansas Museum has had numerous requests for colonies of the larger beetles and for information as to how they should be used. Hall and Russell (1933) have described the technique used at the Museum of Vertebrate Zoölogy, University of California. The methods have been improved and greatly simplified since that time.

It is a very simple matter to acquire a colony of dermestids. Anyone who has ever disturbed an animal carcass has seen these brownish-grey beetles with their floury abdomens and the prickly brown larvae scurrying out of the light. They can be found in large numbers under any old carcass that may be seen out in the open, or from a carcass that has been hung out to dry for several days.

The room in which these bugs are housed need not be very elaborate, but there are a number of requisites to be kept in mind when it is built. The beetles will migrate during the spring months and the collections of skins of the museum should be in a separate building. The size depends upon the number of specimens that it is intended to hold. At the University of Kansas Museum we have a room about fifteen by thirty feet. The room should be insect proof as nearly as possible. The walls, floor, and ceiling should be plastered smoothly so that spiders and cockroaches can be kept at a minimum.

In our bug room the windows are small and screened with fine copper mesh. They are tightly sealed during the winter, but may be opened in the summer to regulate the temperature when the preparator is working in the room.

Shelving can be of anything, but preferably of soft pine or steel. If constructed of soft pine, it will have to be replaced every five or six years because the larvae will bore their way into the wood to pupate and weaken the structure. The room should be absolutely dark at all times, as the beetles will not do their best in the light. The temperature need not be kept absolutely constant. In the winter, we have several steam pipes that furnish the heat. All that is necessary is to keep the room warm.

We have found that a hail-screen cage on a steel-top table is a very useful receptacle for specimens when they are first brought in from the drying line. The purpose of the hail-screen cage is to keep out cockroaches and animals such as mice which sometimes get into the bug room in spite of all precautions.

The animals that are to be cleaned should be drawn and all the feathers, hair, and skin removed. It is a good practice to remove the tough calluses from the feet in the larger birds because the bugs will seldom be able to clean them up after the cartilage and skin has hardened. Special care should be taken to remove the primaries and other feathers from the tips of the wings.

Material which is left uncleaned by the bugs will have to be subjected to a tedious process of boiling and scraping, which in the case of small specimens is almost certain to destroy delicate structures.

In warm weather it is necessary to do some defleshing. Large specimens should have most of the muscular and fatty tissue removed from the fleshy parts of the body.

It is well to disarticulate large specimens before they are hung up to dry so that they will not be bulky and hard to handle. The tongue and hyoid apparatus of large mammals should be removed and the hyoid apparatus dried separately. All skeletal material should be prepared so that air can circulate freely about it. Slits should be made between the ribs of large animals. Flies deposit eggs in small pockets that are not exposed to the air and specimens that have been infested with maggots are not cleaned up so well by the bugs.

After the animals have been drawn and prepared for skeletonization they should be hung up some place in the open where they can dry rather rapidly. In the case of the larger birds, it is advisable to tie the wings against the body and then with a half hitch of the same cord around the neck hang the carcass out to dry.

When the carcasses are dried so that a hard coat is formed over the flesh, they are brought into the bug room and placed inside the cage on the steel table.

Within a few days after the carcasses have been placed in the bug room they are ready to be put away in boxes. The eggs that have been laid on the carcass after it was placed in the bug room and those that had been laid on it while drying will have been hatched and the resulting larvae will begin to eat the flesh. Whenever the small particles of bug droppings appear on the carcass it is ready to be put into boxes.

These are double boxes made of corrugated straw board just large enough to contain the carcass. There are several advantages of the corrugated boxes over steel or wooden boxes. The small corrugations serve as places for the larvae to pupate so that the entire life history of the beetle take place within the same container

The boxes are cheap and can be replaced every few years. They are tight-fitting and thus help to control spiders, and they are substantial enough to be stacked.

If the skeletons are small ones they need not remain in boxes very long. A mouse or small bird will be cleaned in one or two days. Large skeletons will require a corresponding length of time. Unless we are in immediate need of the skeletons we leave them all until fall.

In the late fall the final cleaning begins. By that time the weather is cool enough so that the preparator is not annoyed by "bug dust," which is composed of the spiny larval bristles. The combination of minute spines and the preparator's perspiration produces very unpleasant effects.

The contents of each box are emptied upon a large square of black paper. With a pair of forceps, when necessary, the worker sorts over the material, picking out the bones which are then dusted and placed in specimen boxes.

The presence of fat often creates a definite problem. Long bones may contain considerable fat. If much of it is present in any place it will be spread over the entire skeleton by the bugs. Such skeletons as those of hawks and ducks will often come out covered with grease. It is a good procedure to remove as much fat as possible from the carcass to prevent its occurrence on the bones.

A twenty-eight percent solution of ammonia water serves as an adequate and efficient method of degreasing the skeletons. Immerse the bones and leave them for twenty-four hours. Remove the bones and place them in water for another day and then place them in the sun until they are thoroughly dry. The sun will bleach the bones slightly during the drying.

If skeletons of large mammals are desired for mounting purposes it is suggested that small holes be bored in each end of the long bones and the fatty contents be forced out with the aid of steam and air pressure.

Skull cleaning is a problem in itself. Mr. A. E. Borell (1938) suggests the use of small metal containers into which the skull is placed with a number of larvae. It is during the larval stage that the bugs do their most rapid and effective work. However, if there is no immediate need for the skull it may be left on the skeleton and will in time be cleaned up by the bugs. For best results the skulls should be put in the bug room as soon as they are obtained except that the larger ones will have to be dried enough so that they will not become covered with mildew.

The dermestid method has many advantages over the maceration method or boiling. The ease with which cleaning is accomplished is a great advantage. The only limit to the number that can be cleaned is the number that can be obtained. One preparator doing part-time work can clean thousands of skeletons in one year's time.

But even more important for research is the fact that the skeletons come out intact with sutures in place and soft bones undissolved. No ligaments are weakened to the extent of losing minute bones. Hyoid apparatus, zygomatics, lacrymals, auditory bullae, phalanges, and other elements are certain to be retained.

A striking example of the efficiency of the dermestid method is presented by a small ring-neck snake. It would be nearly impossible to clean such a specimen with its scores of tiny curbed ribs and its minute vertebrae. But a few hours in the bug room will provide a perfect skeleton, clean and white as a pearl, with every tiny rib firmly in its own place.

While a few preparators have stated that they attributed the loss of certain small bones to the workings of the bugs, we have never found it to be true in this museum. It was only by dermestid method that I was able to discover the wide prevalence of the os opticus of the bird's eye.

In other methods of preparing skeletons large animals present great difficulty in the cleaning problem, but in the dermestid method size is no handicap. It is just as easy to clean a moose as it is to clean a mouse.

If the bug room contains large and active colonies of dermestids, skeletons such as those of small birds, bats, and mice need not be hung out to dry before being put in the bug room. Forty-eight hours after they have been placed in the hail-screen cage they will be stripped clean.

There are probably a number of reasons why the dermestid method has been so successful in the University of Kansas Museum. The prime requisite for the dermestid method is, of course, a large supply of bugs. And to have a large and constant supply of bugs there must be an adequate food supply. If necessary, carcasses of common animals must be put in the bug room to feed the beetles. At the present time the bug room in the University of Kansas Museum is literally alive with bugs, and the peculiar noise of their activity is never hushed.

Flesh should not be removed from small skeletons and skulls, as there must be sufficient food material for the bugs to become established.

We have found that papier-maché bricks are the most successful provision for pupation of bugs not in individual boxes. These bricks may be placed around about the room, on the floor, in the cages, or on the shelving.

The worst pests of the bug room are the spiders and cockroaches. We take as many precautions as possible to prevent these pests from getting into the bug room. In spite of all our efforts, however, they do manage to get in. Because of this we have found it expedient to clean the bug room every few years, destroying all old boxes and fumigating thoroughly with sulfur. In a few months, as I have already suggested, we will again have a large working colony.

The final requisite for good bug work is absolute darkness. They are naturally found either under a carcass or excavating beneath the dried surface. This should be kept in mind in order to obtain clean skeletons.

I wish to acknowledge my indebtedness to Mr. C. D. Bunker, of the University of Kansas Museum of Birds and Mammals, under whose direction and supervision this method of cleaning skeletons has been developed.

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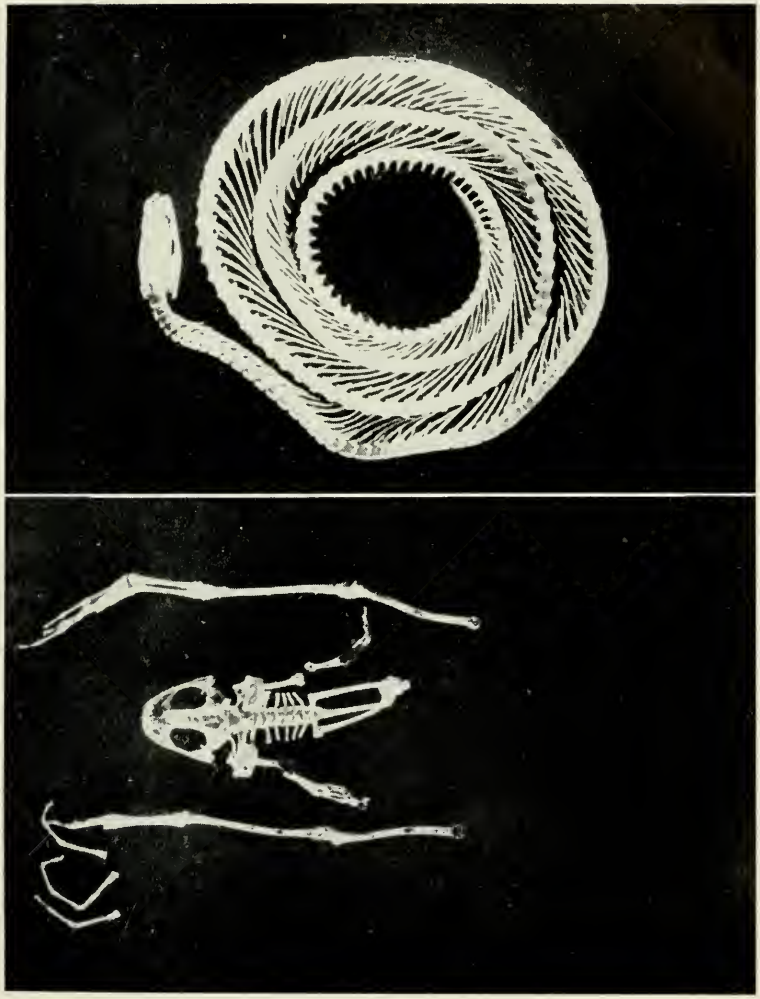
PLATE XLII



Upper. *Diadophis punctatus arnyi*. K. U. 21232.
Lower. *Acris gryllus*. K. U. 21238.

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New Species of Mexican Anura

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ABSTRACT: Five species of Mexican tailless amphibia are described as new from the Edward H. Taylor-H. M. Smith collection: *Hyla hazelae,* type locality, Cerro San Felipe, Oaxaca, Oaxaca; *Hyla robustofemora,* Cerro San Felipe, Oaxaca, Oaxaca; *Hyla robertsorum,* El Chico National Park, southern Hidalgo; *Syrrhophus latodactylus,* Huasteca Cañon, 15 km. west of Monterrey, Nuevo León; *Eleutherodactylus vocalis,* El Sabino, Uruapan, Michoacán.

WHILE collecting at night on the Cerro San Felipe, a mountain which rises just to the north of the city of Oaxaca, I obtained two specimens of a small species of *Hyla* from brush and weeds growing along a small stream, fed by a spring, at an elevation estimated to be about 2,700 meters.

The frogs were calling from heights of from four to ten feet above the ground. Numerous specimens were heard.

Hyla hazelae sp. nov.

Holotype. EHT-HMS, No. 16263; collected on Cerro San Felipe, about ten miles north of Oaxaca, Oaxaca, August 22, 1938 by Edward H. Taylor.

Paratype. EHT-HMS, No. 16262. Topotype, same date and collector.

Diagnosis. A small *Hyla* with anal flap narrowed and elongated, opening on a level with ventral surface of the femur; below edge of flap a series of much enlarged tubercles; snout slightly truncate; the canthus distinct but somewhat rounded; webs on hand present but greatly reduced; base of thumb enlarged with a patch of horny tubercles which may extend on edge of finger; feet little more than half webbed; tympanum moderate, little less than half diameter of

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eye; tibiotarsal joint reaches anterior corner of eye; vomerine teeth between middle of large choanae; subarticular tubercle of outer finger divided.

FIG. 1. *Hyla hazelae* sp. nov. Type. EHT-HMS, No. 16263; Cerro San Felipe, Oaxaca, Oaxaca. Actual snout to vent measurement, 35 mm.

Description of the type. Head very slightly wider than long, the canthus distinct, somewhat rounded; vomerine teeth in two raised, slightly diagonal groups lying completely between the choanae, and not or scarcely reaching their upper level; the groups are transversely oval, separated from each other and the choanae by an equal distance; openings of the mucous glands in the roof of mouth forming a straight line which is closer to the vomerine teeth than to anterior part of mouth; tongue generally oval, very slightly emarginate behind, free for about one-sixth of its length only, more than

half the width of head; openings of the vocal sacs very much elongated (5.5 mm.); distance between choanae, 3.5 mm.; diameter of choanae, 9 mm.

Nostrils pierced near the extreme tip of snout at its upper edge, but the snout slopes forward to lip, the profile in outline is curved; loreal region somewhat concave, sloping very obliquely to lip; eyelid very distinctly narrower than the interorbital distance (3.15 to 4.2 mm.); diameter of eye about equal to its distance from nostril;

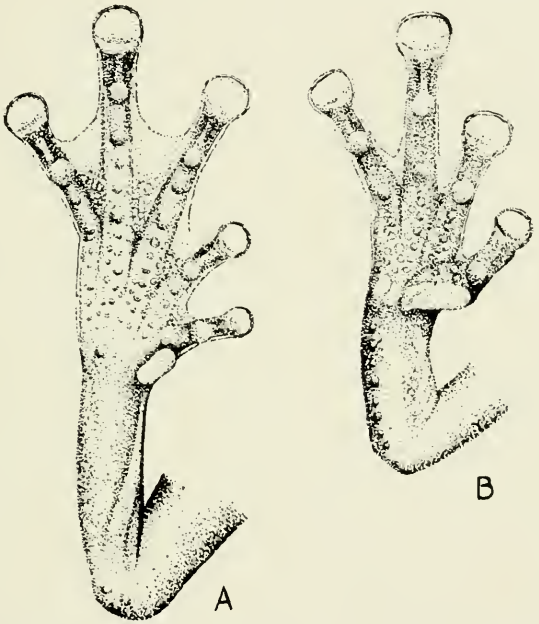


FIG. 2. *Hyla hazelae* sp. nov. Type. EHT-HMS, No. 16263; Cerro San Felipe, Oaxaca, Oaxaca. A. Ventral surface of foot; B. Ventral surface of hand. ×3.

tympanum distinct, small (1.6 mm.), overhung by a very heavy, thickened, somewhat angular fold which passes from eye to near insertion of arm, and conceals the upper part of the tympanum; the areas about nostrils somewhat swollen with a slight depression between them.

When limbs are folded at right angles to the body the heels overlap about two millimeters; the tibiotarsal articulation reaches to very near the anterior edge of the eye; a skinfold across the breast; anal flap lengthened and narrowed with a strong median groove; the anal opening is at about the level of the ventral surface of the femur.

Hand about one-fourth webbed, the webs continued as rather wide margins on the digits to the digital pads; width of the latter distinctly larger than pads on toes; subarticular tubercle of outer finger divided* those on other fingers single, the proximal tubercles of the third and fourth digits are small; a very large, flattened enlargement at base of first finger which bears a patch of dull brown, horny spicules (in paratype these are continued a little onto the edge of the first finger); below the enlargement is an elongated palmar tubercle; outer palmar tubercle bifid (somewhat trifid on right hand); a few distinct supernumerary tubercles; entire under surface of hand with irregular, often indefinite, areolate granules; on under surface of forearm a regular series of rounded tubercles extend from wrist to elbow (these are very distinct, being white or silver-cream on a dark blackish background); feet a little more than half webbed, the webs extended as a fringe to the pads; subarticular tubercles of the third and fourth fingers smallest; a rather large inner metatarsal tubercle, and a small outer one, scarcely distinguishable from the supernumerary tubercles of the sole; a strongly defined tarsal fold to heel.

Skin above appearing rather smooth but actually under the lens it is finely corrugated; sides somewhat wrinkled and granular, the granules indistinct; chin and breast irregularly granular and folded; ventral surface of abdomen and most of under surface of femur evenly areolate, the granules subequal; below anal opening is a row of strongly enlarged salient tubercles.

Color in life. Dorsal surfaces of body and limbs deep leaf green, the ventral surfaces bright lemon yellow. Eyes dark; an ash to gray-lavender line from snout through eye; rows of silver-cream dots under forearm and a similar series on the posterior edge of foot and heel; a silver line above the anus bordered below by black; the large tubercles below anus tipped with silver cream; under surface of hands and feet with considerable pigment; a few minute cream flecks on dorsal surface. Thighs and shanks olive flesh; sides indefinite dark and gray.

Variation. The paratype when caught was a much lighter yellowish-green above, and the posterior parts of thigh were flesh color.

In alcohol there is no trace of the line from snout through eye. The paratype has less pigment under palms and soles. In the preserved specimens there is a lighter area indicated under the eye which I failed to observe in the living specimens.

* Incorrectly shown in figure 2B.

Measurements in mm. Nos. 16263, 16262; sex, ♂, ♂; snout to vent, 35, 35.2; length of snout, 4.8, 5; head width, 11.9, 12.7; head length, 11.2, 11.8; diameter of eye, 3.5, 3.6; greatest diameter of tympanum, 1.6, 1.9; eye to nostril, 3.7, 3.5; distance between nostrils, 3.1, 2.9; width of upper eyelid, 3.15, 3.1; interorbital width, 4.2, 4.5; arm, 23.5, 23.5; hind leg, 57, 58; tibia, 17.5, 18; foot, 25, 26.

Remarks. The species is related to *Hyla bistincta,* which occurs on the same mountain. It differs from that species in the reduced size of the nuptual callosities on the first finger and the absence of asperities on the second finger. The presence of the very large subanal tubercles will distinguish the form from *bistincta* as well as other species of the genus having the narrow, elongated anal flap.

The species is dedicated to Mrs. Hazel Roberts who, with her husband Mr. H. Radclyffe Roberts, assisted in making collections on the Cerro San Felipe.

In the summer of 1938, I obtained a specimen of an undescribed *Hyla* at night, hopping along the edge of a small spring-fed rivulet at an elevation of about 2,300 meters on the Cerro San Felipe. The frog, frightened by my approach, jumped into the rivulet, swam to the opposite side and clambered up the bank, without attempting to hide under the water. Only by an examination of the terminal phalanges did I assure myself that this was not a specimen of the genus *Cauphias,* which it resembles in general habitus. The terminal phalanx is pointed and a small intercalated bone is present between the two distal phalanges.

Hyla robustofemora sp. nov.

Type. EHT-HMS No. 16314, adult male; collected on Cerro San Felipe about ten miles north of Oaxaca, Oaxaca, at an elevation of between seven and eight thousand feet, by Edward H. Taylor.

Diagnosis. Tympanum concealed, but indicated by a depression; no canthus rostralis; a heavy, thickened fold from posterior corner of eye to shoulder, with a branch to above insertion of arm; snout very short; the diameter of eye a third greater than snout length; no web or but the slightest indication of webs between fingers; toes webbed to the digital pads; a well-defined inner and a very dim, flat, outer metatarsal tubercle; a widened flap of skin on inner edge of first toe; anal flap not extending below level of the middle of femur; posterior face of femur not granular or areolate; no fold on breast; vomerine teeth in two rounded groups, which are double the

size of the small, transversely oval choanae; no vocal sac; nuptual callosity covered with dark, horny asperities.

Description of type. Vomerine teeth in two rounded areas, separated from the choanae by a distance twice as great as the distance which separates the tooth groups; vomerine areas, reaching beyond anterior level of choanae and behind posterior level of choanae, double the area of a single choana; the teeth, four in number, irregularly scattered; openings of the mucous glands form a slightly

FIG. 3. *Hyla robustofemora* sp. nov. Type. EHT-HMS, No. 16314; Cerro San Felipe, Oaxaca, Oaxaca. × 1. Actual snout to vent length, 55 mm.

curved line, nearer the front rim of mouth than the choanae; a pigment spot behind the premaxillary region; skin of the roof of the mouth distinctly plicate behind vomerine teeth; tongue wide, subcircular, very slightly emarginate posteriorly, free for about one-fourth of its length; no vocal sac (at least in the mouth no openings are discernible and there is no external evidence that a sac is present).

Head thick, short, much wider than long; snout distinctly shorter than eye; distance from eye to nostril, the distance between nostrils, and the width of the upper eyelid, are equal; interorbital width greater than that of an eyelid; a heavy thickened fold from eye to middle of body along side above arm, while a branch fold runs to near arm insertion; skin of region behind jaw angle somewhat

thickened leaving a triangular depressed area. In this area is a very small deeper depression, perhaps indicating the position of a concealed tympanum; skin of the dorsal surface lacking tubercles; under the lens the skin is somewhat roughened with irregular corrugations while on the limbs and posterior part of the back the skin is more or less granular (a condition not evident to the naked eye); chin, abdomen and a patch on the proximal part of the ventral side of thigh, areolate, the large granules more or less equal; when arm

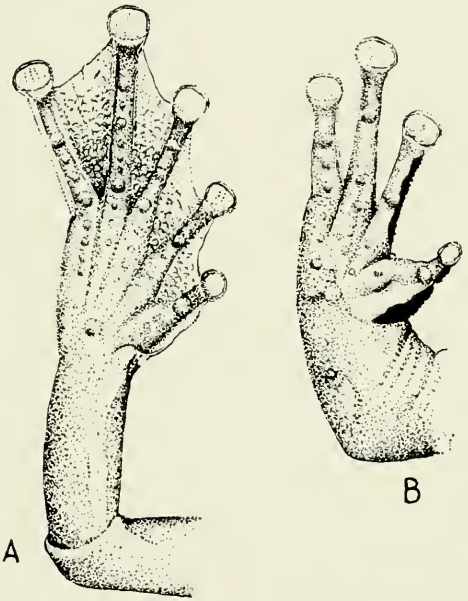


FIG. 4. *Hyla robustofemora* sp. nov. Type. EHT-HMS, No. 16314; Cerro San Felipe, Oaxaca, Oaxaca. A. Ventral surface of foot; B. Ventral surface of hand. ×2.

is extended a very slight axillary web evident; anal flap somewhat elongate, narrowed, grooved medially; anal opening on a level with the middle of femur and followed by a deep groove.

Arms thick; fingers without a trace or only a faint trace of a web; first finger very short, reaching the subarticular tubercle of the second, greatly thickened and widened at base, bearing a large area covered with blackish, horny, nuptual asperities, which are continued, on side of digit, to the pad; a similar patch on second finger, extending to the terminal pad; none on third finger; subarticular tubercle of outer finger not bifid; an elongate tubercle below the nuptual swelling; a large palmar tubercle more or less divided in

three parts; one tubercle under the forearm; legs thickened, the tibiotarsal articulation reaching to near the posterior corner of eye. Toes fully webbed (the last joint of the third toe on one foot, and on one side of the other, is free; I suspect this condition is due to an old injury and is not normal, since the fourth toes are webbed to the pad); a small, oval, inner metatarsal tubercle its length contained in its distance from tip of inner toe, three and one-half times; outer metatarsal tubercle small, flat, more or less indistinct; a more or less distinct, thickened, tarsal fold extends to heel; supernumerary tubercles on sole.

Color. Above, a uniform dull olive-green, somewhat lighter on side of head and body; chin, gray with yellow flecks; abdomen, creamy yellow with some pigmentation posteriorly, especially under posterior part of femur; palms and soles, dark lavender-gray; posterior side of femur gray with a wash of yellow; a cream spot under forearm; a few cream spots on side, on anterior face of femur, and at knee and heel; a dim spot of cream on anal flap.

Measurements in mm. Snout to vent, 55; length of snout, 4.3; length of head, 15.8; width of head, 19; diameter of eye, 5.15; eye to nostril, 4; width of upper eyelid, 4; interorbital space, 5; distance between nostrils, 4; distance between choanae 4.6; transverse diameter of choanae, 0.8; width of tongue, 11; width of a group of vomerine teeth, 1.6; arm, 35.3; leg, 86.2; tibia, 26.5; foot, 39; diameter of toe pad, 2.6; diameter of largest finger pad, 3.1.

Remarks. The general resemblance of this species to the description of a form described by Brocchi as *Cauphias crassum* is rather striking, and were it not for the fact that Brocchi states—"Les dernières phalanges sont obtuses, tronquées à leur extrémité antérieure," and Kellogg states "terminal phalanges T-shaped," I might suspect I had before me a specimen of *Cauphias* closely related to *crassum*. However, the toes and terminal phalanges of this species resemble those of typical *Hyla* and a small intercalated plate is present between the last two phalanges.

The relationship of this species is closest to the species *Hyla robertsorum* from Hidalgo, with which it agrees in lacking a vocal sac, but from which it differs in having the concealed tympanum, the shorter, thicker femurs, shorter snout, the tibiotarsal articulation reaching to back of orbit instead of between orbit and nostril, and the feet almost completely webbed instead of about three-fourths webbed. The heavy, horny excrescences on the nuptual swelling on the base of first digits on hand are blackish-brown. From *H. bis-*

tincta, it may be distinguished by the concealed tympanum, much greater webbing on the toes, less developed canthus and the absence of a vocal sac. From other Mexican hylas, it may be distinguished by the absence of a vocal sac.

I obtained a large series of an undescribed species of the genus *Hyla* while collecting in the El Chico National Park, near Pachuca, Hidalgo, with Mr. and Mrs. Radclyffe Roberts. The specimens were found in plants along the tiny spring-fed rivulets that cross the open meadows. The leaves of the plants are large and at the base of the petiole small pockets of water are held. It was in this specific habitat that most of the specimens were found. The frogs were discovered early in the morning, at which time they were very inactive due to the cold. Later they became more active and if disturbed would dive into the water and take refuge in the mud at the bottom of the stream.

During the several days spent in the vicinity none was heard calling. Lacking a vocal sac it may be that the voice is weak and inaudible at a distance at which frogs may usually be heard. In the same habitat I obtained *Hyla lafrentzii*, *Hyla eximia* and a form belonging to the *Rana pipiens* complex.

I dedicate the species to Mr. and Mrs. Roberts, who helped collect the type series.

Hyla robertsorum sp. nov.

Holotype. EHT-HMS No. 16264; collected at El Chico National Park, Hidalgo, August 7, 1938, by Mr. and Mrs. Radclyffe Roberts and E. H. Taylor.

Paratype. EHT-HMS Nos. 16265-16313, same place, date and collectors as the type.

Diagnosis. A medium-sized member of the genus, characterized by the absence of vocal sacs in males, a tympanum half the diameter of eye, fingers free, toes two-thirds to three-fourths webbed; canthus rounded, eye slightly shorter than snout; tibiotarsal articulation reaching posterior corner of eye; vomerine teeth reaching anterior level and extending behind the posterior level of choanae; digital pads on fingers very slightly larger than those on toes.

Description of the holotype. Vomerine teeth on two rounded elevations, lying between the choanae, reaching anterior, and extending behind their posterior level, each group much larger than a choana; distance between the groups of vomerine teeth greater than their

diameter and greater than their distance from choanae; tongue very broad, subcircular, minutely notched behind, free for about one-fourth of its length; mucous glands, behind premaxillaries, open in an irregular, more or less doubly curved discontinuous groove somewhat closer to the vomerine teeth than to the anterior part of mouth.

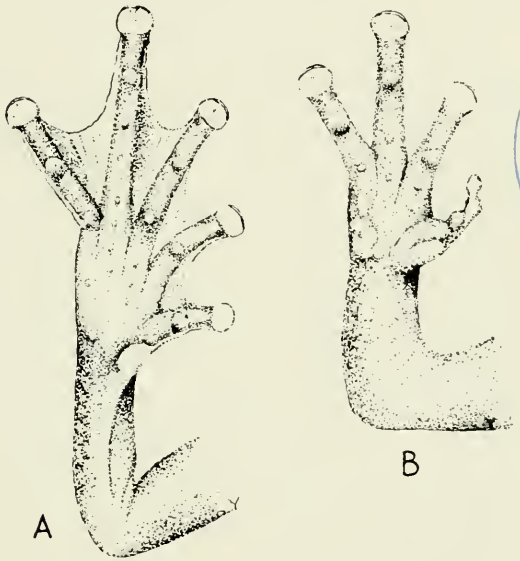
Head slightly broader than long, the eyes not especially prominent; nostril closer to eye than the median anterior point of upper

FIG. 5. *Hyla robertsorum* sp. nov. Type. EHT-HMS, No. 16264; El Chico National Park, Southern Hidalgo. Actual snout to vent length, 48 mm.

lip; tip of snout projecting but slightly beyond mouth; loreal region not or but slightly concave, sloping obliquely to edge of lip; interorbital space (5 mm.) much wider than an upper eyelid (3.1 mm.); latter less than distance between eye and nostril (4.2 mm.); tympanum moderately distinct; diameter of tympanum (2.3 mm.) about half length of eye (4.2 mm.); a slight depression on middle of snout between nostrils; skin appearing rather smooth (under lens the skin appears somewhat roughened); a fold from eye to foreleg; no fold from eye to shoulder; chin and breast with a few pustular tubercles; abdomen and the median underside of femur granular; a triangular

granular area on posterior side of femur below anus, divided by a deep groove from anus; anal flap short, somewhat pointed, marked with vertical furrows.

Fingers practically free (only a very minute trace of webbing at the base of the fingers), the fleshy margin on outer edge of the second and third finger a little wider than on the inner edge; first finger with an elongate, flattened projection at base and an elongate palmar tubercle below it; a median elongate palmar tubercle and an



MARINE BIOLOGICAL LABORATORY WOODS HOLE MASS.

FIG. 6. *Hyla robertsorum* sp. nov. Type. EHT-HMS, No. 16264; El Chico National Park, Southern Hidalgo. A. Ventral surface of foot; B. Ventral surface of hand. ×2.

outer more elongate one divided transversely; subarticular tubercles of first and last fingers larger than those of the middle fingers: that of outer finger not bifid; supernumerary tubercles on palm; a few irregular tubercles on under surface of arm forming a longitudinal row; first finger reaches a little beyond the subarticular tubercle of the second finger; foot two-thirds to three-fourths webbed, the web continued to the pads as a narrow fringe; a well-defined fringe on outer side of fourth toe; a well-defined inner metatarsal tubercle, flat, oval, its length contained in its distance from tip of first toe about three times; outer tubercle small, distinct; supernumerary tubercles confined to sole; a thickened tarsal fold extends to heel; a slight fold across breast; only a trace of an axillary web.

Measurements of the holotype in mm. Snout to vent, 48; width of head, 16; length of head, 14.5; arm, 28.2; leg, 78; tibia, 25; foot, 36; width of finger pad, 2.8; of toe pad, 2.3.

Color. Above, dull olive to brownish-olive with numerous ashy flecks and reticulations; sides brown-ash with a few cream flecks; belly and underside of limbs dirty cream, the pigment thickest on chin and throat; concealed part of feet somewhat olive-yellow, with a few spots and reticulations of this color on the posterior side of foot; posterior face of femur olive with a yellowish wash.

Variations. The males have the base of the first finger greatly swollen, studded with minute spinules which are covered with a very slight, very light brown, horny deposit; a similar line of spinules on the inner edge of the second finger and a tiny patch on the third; a few specimens show no trace of web between fingers; in others there is a trace evident under the lens.

The vomerine teeth are in transverse groups in some specimens and are no longer than a choana. Certain specimens are blackish olive, and the venter and under side of limbs much more heavily pigmented; certain specimens have a few yellow flecks on or above the anal flap; in younger specimens the tibiotarsal joint reaches the anterior corner of eye or slightly beyond.

Remarks. The species needs to be compared only with the recently described species *Hyla robustofemora.* It differs from that species in the presence of a tympanum, the lesser webbing of the toes and the slenderer limbs; in *H. robustofemora* the feet are fully webbed. The two forms agree in lacking a vocal sac and in the character of the nuptual asperities, save that in *H. robustofemora* they are covered with heavy black-brown horn.

A species of frog, first discovered in the central part of Nuevo León, later in the southern part of that state and northern Hidalgo, appears to belong to the genus *Syrrhophus* Cope. It is distinctly larger than the other known species from Mexico, and two of the eight specimens show evidence of vomerine teeth. Otherwise the specimens agree in the characters associated with the genus.

The small, flat, inguinal gland commonly present in *Syrrhophus* (dim or wanting in *S. marnocki*) is present; a flat parotid-like glandular area behind tympanum; a ventral disk limited posteriorly by a transverse fold; finger and toes lacking distinct webs, and bearing the typical distribution of tubercles on sole and palm, cause me

to associate the species with *Syrrhophus* rather than *Eleutherodactylus*.

The two specimens that have vomerine teeth are from southern Nuevo León, geographically intermediate between the other two localities. One specimen has the group of teeth present on one side only; in the specimen chosen for the type, on both sides. Only larger series from the type locality can determine the extent to which the teeth are present. That the whole series are of the same stock is shown by their close agreement in other characters.

Syrrhophus latodactylus sp. nov.

Holotype. EHT-HMS No. 6807, collected at Huasteca Cañon, about 15 km. west of Monterrey, Nuevo León, Mexico, elevation about 680 meters, June 20, 1936, by Edward H. Taylor.

Paratypes. EHT-HMS No. 6805, near Sabinas Hidalgo, N. L. June 17, 1936; Nos. 6809-6812, La Placita (about 8 km. south Jacala, Hidalgo, July 1, 1936; E. H. Taylor, collector).

Diagnosis. A large member of the genus, maximum size 38.2 mm.; tympanum two-thirds to three-fourths the diameter of eye; vomerine teeth present or absent; a small flat gland above groin and a small, flat parotoid; head wider than body; largest digital disks about two and one-half to three times narrowest width of digit; yellowish or light lavender above with deep brown spots or reticulations.

Description of the type. Adult female containing large eggs in ovaries. Head as broad as long, the snout narrowing, then slightly truncate at tip; canthus rostralis rounded, the lores sloping slightly, not concave; eyelid contained in the interorbital distance about one and one-half times; length of eye about equal to its distance from nostril, shorter than snout; diameter of the tympanum (3 mm.) equal to two-thirds the length of the eye (4.5 mm.); distance between nostrils (3 mm.) much less than interorbital distance (5 mm.); tongue rather short, somewhat narrowed anteriorly, not notched behind; two small groups of vomerine teeth, each about as long as the greatest diameter of choanae, separated from each other by a distance greater than length of either group and from choanae by a still greater distance, both groups lying much behind the posterior level of choanae; mucous glands open by a series of pores directly between the middle of the choanae; choanae large, diameter 1.2 mm.

Skin above on head nearly smooth; on back and upper sides of body with very small inconspicuous pustules; chin, breast, and en-

PLATE XLIII

Syrrhophus latodactylus sp. nov.

A. EHT-HMS, No. 6805; Sabinas Hidalgo, Nuevo León. Length, 31.5 mm.
B. EHT-HMS, No. 6806; Huasteca Cañon, Nuevo León. Length, 32 mm.
C. EHT-HMS, No. 6812; La Placita, Hidalgo. Length, 34 mm.
D. EHT-HMS, No. 6809; La Placita, Hidalgo. Length, 34 mm.
E. EHT-HMS, No. 6810; La Placita, Hidalgo. Length, 32 mm.
F. EHT-HMS, No. 6807. Type. Huasteca Cañon. Length, 38.2 mm.

tire abdomen completely smooth. A "disk" on venter limited posteriorly by a transverse skin fold, the anterior limit not clearly defined; underside of thighs with wrinkles, forming a flat reticulum, rather than the typical areolar granules; some granules on the posterior part of the thigh.

Digits of hand with their tips widely dilated, the widest (third and fourth fingers) being 2.6 mm., that on inner finger about double the narrowest width of digit; a large median palmar tubercle; a

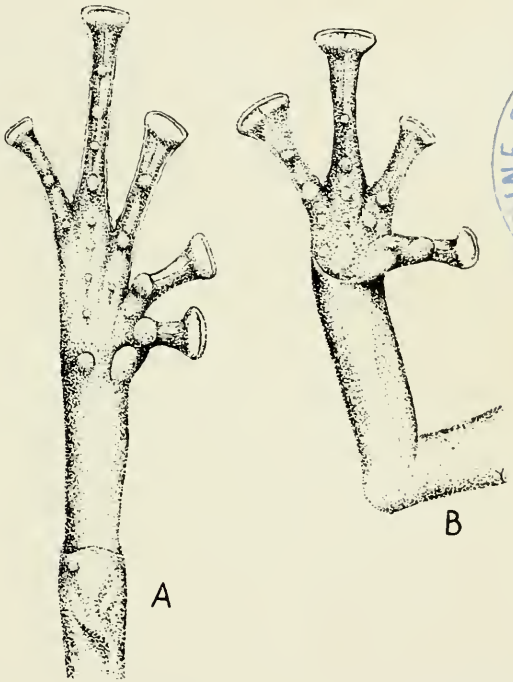


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FIG. 7. *Syrrhophus latodactylus* sp. nov. Type. EHT-HMS, No. 6807, Huasteca Cañon, 15 km. W. Monterrey, Nuevo León. A. Ventral surface of foot; B. Ventral surface of hand. ×3.

smaller one on base of first finger; and a still smaller outer; five other enlarged supernumerary tubercles on palm, anterior to the three palmar tubercles; subarticular tubercles prominent; a very indistinct dermal fringe is evident on edges of digits, the fringe somewhat granulate at the base of the digits; foot short, the digits much widened at tips, but less so than those of fingers; a large inner metatarsal tubercle, its length contained in length of first toe slightly more than one and one-half times; outer tubercle prominent, smaller; subarticular tubercles well developed; three middle

toes with well-developed supernumerary tubercles on sole; a slight (or sometimes deep) transverse groove is evident on the tips of toes; tibiotarsal articulation when brought forward reaches middle of eye.

Color in life. Above light lavender to yellowish-gray with dark brown or blackish-brown spots and reticulations on dorsal and lateral surfaces, and above limbs. Abdomen and most of underside of femur immaculate cream; a very fine peppering of scattered pigment on chin, low on sides of body and under the tibia, hand and foot; a more or less indistinct dark band from nostril to eye, and a spot, bordering tympanum above, usually conspicuous; posterior part of femur with some scattered fine dark pigment and a few small spots about anus.

Measurements in mm. Nos. 6807, 6811, 6810, 6806; snout to vent, 38.2, 35, 32, 32; width of head, 15.2, 13, 13.8, 13.2; length of head, 14.9, 12.8, 12.9, 12.5; diameter of tympanum, 3.1, 2.5, 3, 3; length of eye, 5, 4.2, 4.05, 4.3; eye to tip of snout, 7.5, 5.8, 6.5, 6.1; arm, 24.3, 23.8, 23.2, 19.5; width of largest pad, 2.8, 2, 2, 2; leg, 56, 53.2, 49, 47.5; tibia, 17.6, 17.1, 15.5, 15; foot, 25, 23.6, 20.5, 21.

Variation. The specimens agree in most essential characters. Those from the higher more southern localities seem to be more lavender on the dorsal surfaces; those from the more northern and lower localities, more yellowish. After two years of preservation they are practically indistinguishable in color. In the specimen from Sabinas Hidalgo, the spotting on the hind limbs is practically obsolete. Variation in presence or absence of teeth has been mentioned. Other variations are discernible from the table of measurements.

Remarks. The widening of the digital pads is greater proportionally than in any other Mexican form referred to, *Syrrhophus*, *Tomodactylus*, or *Eleutherodactylus*, with the exception of those of *Eleutherodactylus alfredi* and *E. spatulatus*.

The first specimen of the species was found hopping among boulders in a dry stream bed, about four kilometers from the town of Sabinas Hidalgo. This locality is about 345 meters in elevation. The type and one other specimen were obtained from the exposed low rock masses near the entrance of Huasteca Cañon, near Monterrey. Both were found at the edges of deep crevices into which other specimens seen, escaped. The elevation here is about 680 meters. At La Placita (a station marked on the highway without houses) the specimens were found at night among outcropping boulders in oak forest at an elevation of about 1,700 meters.

The large eggs found in the ovaries suggest a shortened life history.

With the discovery of more forms in this and the related genera *Tomodactylus* and *Eleutherodactylus* (*sensu lata*) which suggest characters intermediate between them, it will become increasingly difficult to maintain these genera under their present definitions. This is particularly true of *Syrrhophus* and *Tomodactylus* whose differentiation depends upon a difference in the development or shape of the gland in the upper inguinal or lumbar region.

Eleutherodactylus vocalis sp. nov.

Type. EHT-HMS No. 6390; collected Hda. El Sabino, Uruapan, Michoacán, July 25, 1936 by Hobart M. Smith.

Paratypes. EHT-HMS Nos. 6384-6386, June, 1936, Don Julio Ramon Bresson, collector; Nos. 6387-6389, 6391, July 23 to 25, 1936, Hobart M. Smith, collector; all from Hda. El Sabino, Uruappan, Michoacán.

Diagnosis. A medium-sized species (known maximum size 57.5 mm. snout to vent), related to *Eleutherodactylus rugulosus;* tips of digits with widened disks, those of toes very distinctly wider than those on fingers; all disks with a transverse terminal groove; five supernumerary tubercles on palm; none on foot; no web on hand; toes about one-third webbed, the webs continued to tips as distinct fringes; a small outer metatarsal tubercle; a small tubercle on lores; a W-shaped series of pustules more or less defined on back of head and shoulders; heels do not touch when limbs are folded; tibiotarsal articulation reaches between eye and nostril; eye shorter than snout; tympanum of females less than half of length of eye; of males, two-thirds of eye; male with vocal sacs.

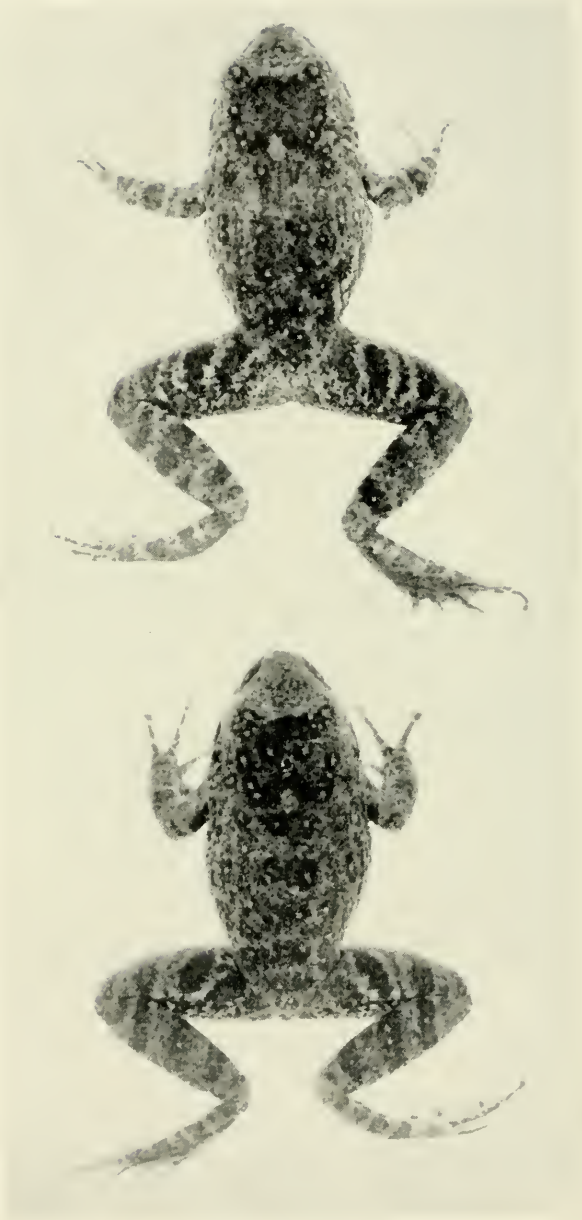

PLATE XLIV

Eleutherodactylus vocalis sp. nov.

A. Type. EHT-HMS, No. 6390; El Sabino, Uruapan, Michoacán. Snout to vent length, 50 mm.

B. Paratype. EHT-HMS, No. 6389. Topotype. Snout to vent length, 50.5 mm.

Description of the type. Adult female containing eggs in ovaries. Snout with canthus rostralis rounded; a depression in loreal region; snout rounded, slightly projecting beyond mouth; eye moderately large, its length (5.9 mm.) distinctly less than length of snout (8.3 mm.); distance between nostrils (3.8 mm.), about equal to the

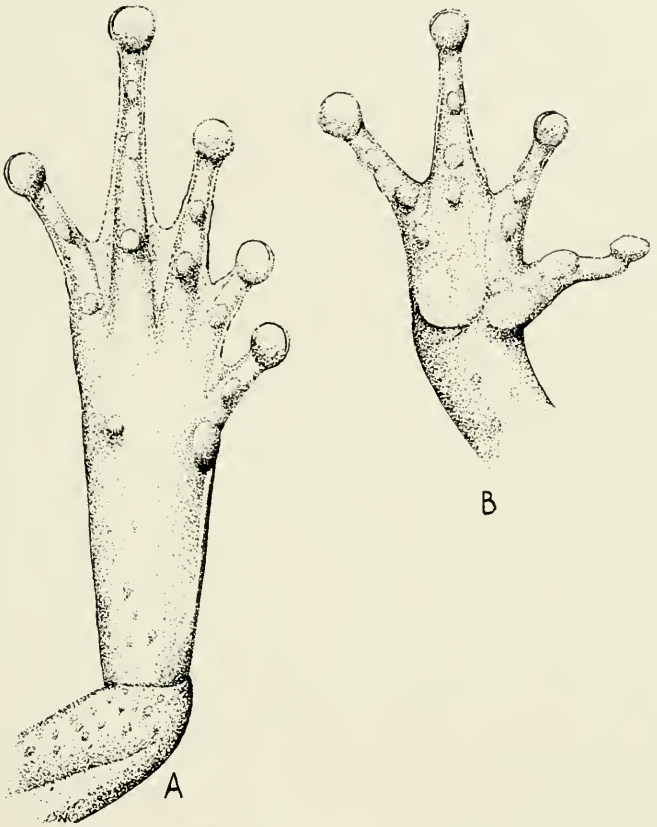

FIG. 8. *Eleutherodactylus vocalis* sp. nov. Type. EHT-HMS, No. 6390; El Sabino, Uruapan, Michoacán. A. Ventral surface of foot; B. Ventral surface of hand. ×3.

interorbital distance (3.9 mm.); eyelid (4.2 mm.) somewhat greater than the interorbital width; tympanum higher than long, its length (3 mm.) about half length of eye, separated from posterior corner of eye by a distance about equal to length of tympanum. Snout rounded, slightly projecting; tongue subcircular, notched behind; vomerine teeth in two strongly raised triangular clusters very narrowly separated (one-fourth width of one cluster), separated from

choanae by a distance greater than length of one cluster; the clusters between choanae, but not reaching their posterior level; two openings of palatal mucous glands medial, slightly in advance of the anterior level of choanae; choanae large, diameter of one contained in the distance between choanae, three and one-half times.

Fingers and toes with broad terminal disks, those of toes distinctly larger than those of fingers; the disks without a transverse ventral groove, but with a terminal transverse groove strongly pronounced. First and second fingers subequal in length; fourth longer than third; no webs on fingers, but slight ridges visible on inner edges of some of the fingers; subarticular tubercles large, rounded; five supernumerary tubercles on palm; a large, wide, palmar pad, notched in front and another elongate pad on outer base of first finger, its length in its distance from tip of first finger, two times; toes between one-third and one-half webbed, the webs continuing as narrow fringes to disks (see figures); subarticular tubercles elongate oval; no supernumerary tubercle on toes or sole; an elongate inner metatarsal tubercle, contained in its distance from tip of first toe, two and one-half times; outer tubercle low, small, reaching anterior level of inner; a sharply defined tarsal fold extends half length of tarsus, or slightly farther.

Skin strongly pustulate, the pustules forming an indistinct W-shaped pattern on back of head and shoulders, and on the sides they form somewhat irregular rows; a conspicuous pustule in loreal region; eyelids heavily pustulate; groin and anterior and posterior parts of femur smooth; a heavy fold passing angularly back from eye and overhanging upper edge of tympanum; two large tubercles behind lower posterior edge of tympanum; a sparse row of tubercles under forearm; chin and throat nearly smooth; sides and abdomen, posteriorly, strongly granulate, the ventral disk not or only faintly indicated; ventral part of femur, save near anus, perfectly smooth. A triangular area on posterior face of femurs below anus strongly granular; when legs are folded at right angles to body the heels are minutely separated; tibiotarsal articulation reaches between eye and nostril, when leg is brought forward.

Color. Above, light gray with an indefinite pattern of darker gray; summits of pustules dull white; a median gray spot on shoulders. Ventral surfaces cream, more or less peppered with scattered pigment; under side of tibia mottled with gray; limbs barred with darker and lighter; snout generally lighter gray; a dark indefinite bar across head between eyes.

Measurements in mm. Nos. 6390, 6387; sex ♀, ♀; snout to vent, 50, 57.5; width of head, 19.1, 22; length of head, 18, 21.8; arm, 26.4, 34; leg, 72.5, 87; tibia, 23, 27.3; foot, 31.8, 37.2; eye length, 5.9, 6.5; tympanum, 3, 3.4.

Variation. All the specimens save No. 6388 are females and agree with the type in all essential characters; all seem to have more pigment on chin, breast, and back than type. On the distal posterior face of femur there are distinct cream spots. The tympanum of the male is a little longer than high (3.2 mm.), distinctly more than half the length of eye (5.7 mm.); the male has well-developed vocal sacs, the openings behind the tongue elongate; and it is distinctly less pustulate than females.

Remarks. This form may be distinguished from the related *Eleutherodactylus rugulosus* by the greater webbing on toes; by the somewhat more robust body; the presence of vocal sacs in the males; and the tympanum smaller in proportion to the eye.

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New Salamanders from Mexico with a Discussion of Certain Known Forms

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ABSTRACT: Seven new species of salamanders are described from Mexico: *Bolitoglossa dimidiata* (*chiroptera* group), Guerrero, Hidalgo; *Thorius pulmonaris*, Cerro San Felipe, Oaxaca, Oaxaca; *Thorius narisovalis* (related *to pennatulus*), Cerro San Felipe, Oaxaca, Oaxaca; *Ambystoma bombypella* (*tigrinum* group), Rancho Guadalupe, 14 km. east of San Martín, México; *Ambystoma ordinaria* (*tigrinum* group), near Puerto Hondo, Michoacán; *Ambystoma amblycephala* (*tigrinum* group), 15 km. W. of Morelia, Michoacán; *Siredon lermaensis*, Lake Lerma near Toluca, México.

Thorius pennatulus Cope is discussed and figures given showing variation; *Siredon dumerilii* and *Siredon mexicana* Shaw are discussed. A figure is given of an artificially transformed specimen presumably of *Siredon mexicana* Shaw. Figures are given of all new species.

A SERIES of about thirty specimens of a tiny salamander was taken in the mountains to the northeast of Pachuca, Hidalgo. The first specimens were encountered under logs, occasionally under the same logs as *Bolitoglossa multidentata* (Taylor) in the El Chico, Parke Nacional. Later they were found at a somewhat lower elevation a few kilometers north of the park, at a point about four kilometers below Mineral del Monte, known to the natives as Guerrero. It is the ruins of a great machinery factory. Although this name has appeared before in the literature of Mexican salamanders (Dunn 1926), I believe that none of the recent maps give its location.

This form has been confused with *Oedipus townsendi* in the literature, but differs from that form in having a distinctly different type of foot and hand, belonging to the *chiropterus* group of *Bolitoglossa* rather than to *Thorius*.

*Bolitoglossa** *dimidiata* sp. nov.

(Text figs. 1 and 2)

Holotype. EHT-HMS No. 17677 ♂, Guerrero, near Mineral del Monte, Southern Hidalgo, Mexico, August 8, 1938; E. H. Taylor, collector.

Paratypes. EHT-HMS No. 17671-17676; 17678-17689; 17691-17692; 17694-17705, Guerrero and El Chico National Park. Elevation, approximately 2,660 to 3,300 meters.

Diagnosis. A diminutive form of the *chiroptera* group, the maximum size under 28 mm. from snout to vent; nostrils permanently enlarged, pointed almost directly forward; eye about as long as snout

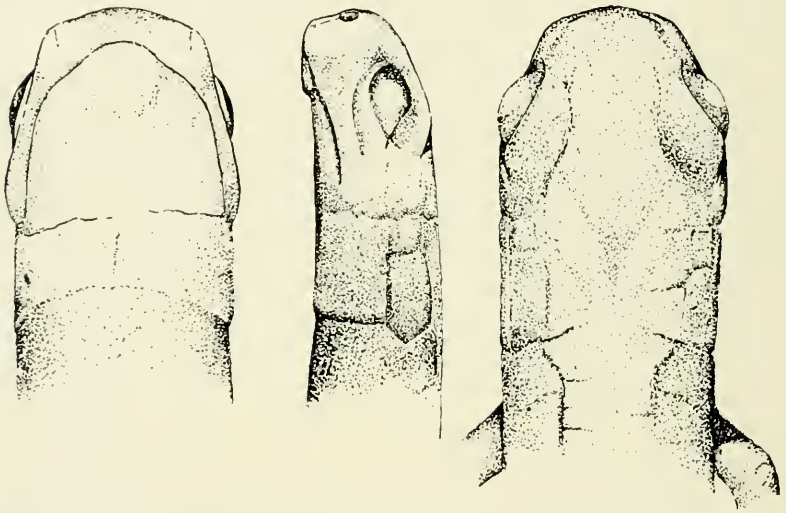


FIG. 1. *Bolitoglossa dimidiata* sp. nov. Guerrero, Hidalgo. EHT-HMS, No. 17674. ×7.

or a little longer; groove from under eye does not reach edge of upper lip; limbs separated by about four (five occasionally in females) costal folds; width of head in snout to vent length about six times; first toe shorter than fifth; a projecting growth from cloaca in males.

Description of the holotype. Head rather flat between orbits and in occipital region; snout rather rounded at tip, but the curving line seen from above is broken by the submarial swellings; no canthus rostralis; nostrils large, directed forward, their diameter contained in distance from the eye about twice; distance between nostrils (1 mm.) minutely greater than distance from eye to nostrils; inter-

* Mr. Radclyffe Roberts has informed me that *Oedipus* Tschudi (1838) for a genus of salamanders is preoccupied by *Oedipus* Berthold (1827), an Orthopteran genus.

orbital distance (1.6 mm.) greater than the width of an eyelid (1 mm.); length of eye (1.6 mm.) equal to the length of the snout (1.6 mm.); subnarial swellings relatively very large, prominent; a well-defined hedonic gland on the chin; tongue typical with a well-defined sublingual fold; four-five maxillary teeth confined to region under the subnarial swellings; three teeth pierce the edge of lip on premaxillary; mandibular teeth enlarged, irregular, seven on each side; vomerine teeth three or four on each side in two somewhat curved diagonal series not extending beyond the outer level of choanae; parasphenoid teeth in a single group, narrowed anteriorly, widening posteriorly, and notched behind; separated from the vomerine teeth by a distance about four times the diameter of a choana.

The groove below eyelid terminates below the posterior part of eye about midway between eye and mouth (not reaching lip as in most if not all of the members of the genus *Thorius*); groove running back from angle of eye more or less distinct (if slightly dried the groove appears); first transverse groove crosses down behind the mouth angle and across anterior part of throat; a well-defined nuchal fold crosses throat and is continued on sides of neck as an irregular groove; growing less distinct, it meets the groove from opposite side; on each side of the dorsolateral region of neck, connecting the two transverse grooves, are two longitudinal grooves (the upper irregular); the area between them is divided into two unequal areas by a short transverse groove which continues a little on the dorsal side of neck; thirteen costal grooves, the axillary and inguinal more or less distinct; the posterior extension of the hyoid apparatus below skin makes a broad fold on side of neck; it terminates posterior by arm insertion; a constriction on base of tail more or less developed; about twenty grooves visible on proximal part of tail; a glandular spot behind insertion of femur; cloacal walls with numerous minute papillae.

Limbs short, when adpressed, separated by about four (or slightly less) costal folds; hand with digits webbed at base, the fingers moderately widened, the terminal phalanx and part of the adjoining phalanx free in the three outer fingers; tip of first finger not free; pads on ventral surface of tips of digits swollen; foot with inner toe involved in the web; outer toe very short, but with tip protruding from web; three middle toes each with at least the outer phalanx free.

Color in life. Above uniform lavender with a small, somewhat reddish spot on the dorsal surface of the femur; below dirty cream-white with a scattering of pigment; subnarial swellings creamy white; a few minute flecks of white on sides; indication of a buff spot behind transverse groove or dorsal side of neck.

Measurements in mm. Nos. 17677, 17674; sex ♂, ♂; snout to anterior part of vent, 24.7, 23.3; anterior end of vent to tip of tail, 28.4, 25.2; head width, 4, 4; head length to nuchal fold, 6.2, 5.5; axilla to groin, 14, 13.8; arm, 5.1, 4.65; leg, 5.6, 5.5.

Variation. Males, for the most part, agree with the description; females differ in being somewhat darker in coloration above, the

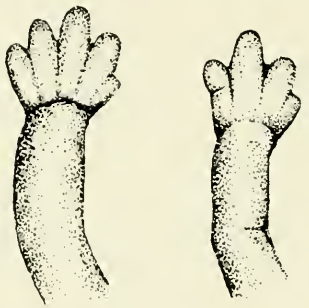


FIG. 2. *Bolitoglossa dimidiata* sp. nov. Guerrero, Hidalgo. EHT-HMS, No. 17674. ×7. Foot and hand.

fawn-colored spot on the neck being usually distinct. The ventral surfaces are often much more pigmented with yellow-cream flecks visible on chin and throat.

Females differ in having larger series of jaw teeth. In No. 17700 there are 19-19 maxillary teeth; vomerine teeth, 4-4; premaxillary teeth, 6; mandibular teeth, 18-19. The nostrils in females are about the same size as those in the male type, but the subnarial swellings are scarcely noticeable. The limbs of females are proportionally shorter compared with the axilla to groin distance and are separated in adult females by about four and one-half to five folds.

The males have one or two fleshy protuberances from the postero-dorsal wall of the cloaca, the significance of which is not known. They strongly suggest some type of intromittent organ. A similar growth, less conspicuous, is present in the cloaca of *B. chiroptera*, lending weight to the suggestion of close relationship between the forms.

One specimen, No. 17674 (measurements given), has the snout broader, the nostrils directed completely forward, the eye a third longer than the snout; and there appears to be a slight difference in the character of the toes. It was collected in a lot with several others in the same pile of leaves and agrees with the others in characters not mentioned. It is likely that the differences are anomalous (figured).

There is a specimen of this species in the Harvard collection, (No. 8018) one of the type series of *Oedipus townsendi* from Guerrero, Hidalgo, and two specimens numbered No. 67654, from Hidalgo.

It can be separated from *B. multidentata* by the enlarged nostril and the much shorter legs and smaller body; from *B. chiroptera* by the enlarged nostril (which remains large in the adult), and by a somewhat smaller size.

Living among the wet leaves on the ground at an elevation above 2,000 meters on the Cerro San Felipe near Oaxaca, I discovered a tiny salamander with a very large, elongated nostril which appears to be an undescribed species.

Thorius pulmonaris sp. nov.

(Text figs. 3 and 4)

Holotype. EHT-HMS No. 16684, collected on Cerro San Felipe, about 12 km. north of Oaxaca, Oaxaca, August 18, 1938, by Edward H. Taylor.

Paratypes. EHT-HMS Nos. 16676-16711, 16713-16733. Collected same locality, August 18-22, 1938, by Mr. and Mrs. Radclyffe Roberts and Edward H. Taylor.

Diagnosis. A diminutive member of the genus, with permanently enlarged, elongate-oval nostrils, placed diagonally; the groove below lower eyelid intersects the edge of lip; limbs, when adpressed, separated by 2.5-5 costal folds; 12 costal folds (13 grooves) from axilla to groin; no teeth on maxilla; parasphenoid teeth in a single group.

Description of the holotype. Adult female. Head a little wider posteriorly than the body, about as deep as body; distance between orbits a little greater than the width of a single eyelid; nostril elongate, from one-half to two-thirds the diameter of the eye; subnarial swelling not strongly indicated (prominent in males); snout narrowed anteriorly but not "pointed"; groove below eyelid intersects the mouth directly below posterior corner of eye; posterior ends of eyelids not pushed under a diagonal fold; first head groove crosses throat, and terminates on dorsal surface of the head at about level

of eye; a groove forming an arch is more or less apparent on throat, resting on the transverse groove; gular fold prominent, crossing throat, then passing somewhat diagonally across the side of the neck to the dorsal surface, but failing to meet its fellow from the opposite side; groove from behind corner of eye to first vertical groove not or barely indicated in type (more or less distinct in certain other specimens); a groove beginning behind middle of eyelid extends back irregularly to the nuchal fold; region in front of the gular fold distinctly swollen on side of neck; region between eyes

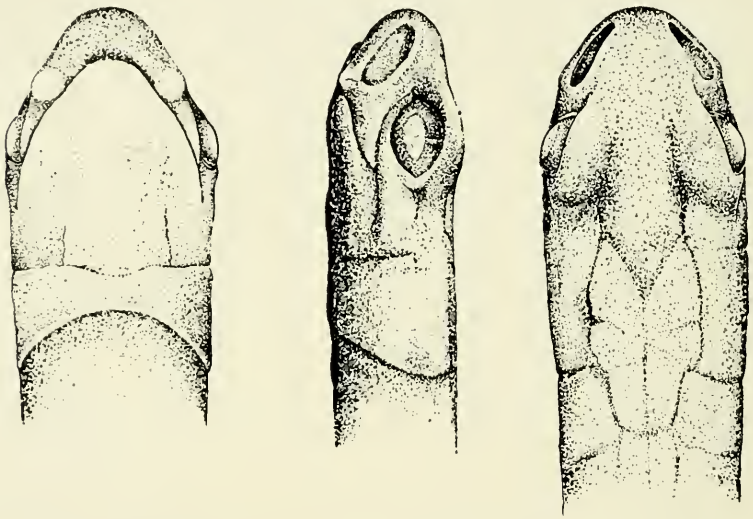


Fig. 3. *Thorius pulmonaris* sp. nov. EHT-HMS, No. 16712. Cerro San Felipe, Oaxaca.

and occipital region somewhat curving. Tongue boletoid; a free projecting sublingual fold; four premaxillary teeth; no teeth discernible on the maxilla; mandibular teeth present; twelve vomerine teeth arranged in a single elevated median patch, partly in two rows, not extending outward beyond the inner edge of choanae; the choanae are narrow slits; parasphenoid teeth in a single elongate patch which is somewhat tongue-shaped, not notched behind, the group separated from the vomerine teeth by a distance nearly equal to the width of the vomerine series.

Skin above generally smooth, but with pitting on the head; pits on snout very distinct; on back, pits are smaller, less distinct; thirteen costal grooves (including the distinct axillary and inguinal grooves); twelve costal folds; limbs small, separated when adpressed

by five folds (in males from two and one-half to four folds); cloacal walls folded (in males papillate); base of tail with a definite constriction; thirty-five grooves on tail, discernible to near tip; a small glandular area posterior to insertion of femur (a circular gland on tip of chin in males not very conspicuous externally).

Digits on the hand rather wide, the tip on first finger free from web; three middle toes free for about a third of their length, the outer and inner toes barely emerging from web; small, distinct pads present at tips on under side of digits; tail longer than head and body; the width of the head contained in distance between snout and posterior end of vent 6.1 times; length of snout slightly longer than eye; width of an eyelid a little less than interorbital distance; length of nostril three-fourths to four-fifths of eye length.

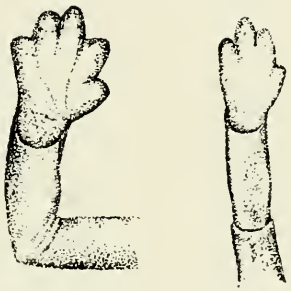


FIG. 4. *Thorius pulmonaris* sp. nov. EHT-HMS, No. 16712. Cerro San Felipe, Oaxaca. Foot and hand. × 7.

Color. Above lavender-slate, below dirty whitish to lavender-brown, less heavily pigmented under tail (sometimes darker brownish or lavender below); a series of small light flecks on chin and occasional ones scattered on ventral surfaces; a few minute whitish flecks on sides; subnarial swelling and a spot on lower eyelid, whitish.

Measurements in mm. Nos. 16684, 16712, 16733; sex, ♀, ♂, ♂; snout to posterior end of vent, 24.4, 27.2, 27.5; tail from posterior end of vent, 35, 35.6, 36; width of head, 4, 4.3; 4.2; length of head, 5.3, 6.1, 6; snout to gular fold, 4.8, 5.4, 5.2; arm, 4.2, 5.6, 4.7; leg, 4.4, 4.6, 5.2; axilla to groin, 15, 14, 15.

Variation. The largest specimen has the maximum snout to (posterior part of) vent length of 27.5 mm. and a maximum total length of 63.5 mm. Males have longer snouts and shorter axilla to groin measurements, resulting in having adpressed limbs closer together. In some of the specimens the vomerine teeth are larger, varying in number from as low as four or five teeth in some males to eight in

others, always in a transverse or slightly V-shaped series. They do not seem to be separated medially and only occasionally are there two rows present.

Remarks. Specimens were found at an elevation of about 2,000 meters on the mountain under leaves and trash on the ground. They were very unequally distributed. Higher on the mountain they are replaced by *Thorius narisovalis*, a form with an enlarged nostril that is about half the diameter of the present species, and living almost exclusively under bark and logs.

The very large nostril and the great amount of surface on the nasal walls suggest that the nasal passage may be used for direct exchange of oxygen in respiration. In males the size of the nostril is only slightly larger than in females of similar length.

Thorius pennatulus Cope

(Plate XLVII, figs. A, B; Text fig. 5)

Thorius pennatulus Cope, Proc. Acad. Nat. Sci. Philadelphia, 1869, pp. 111-112 (Type description; type locality "Orizava"); (?) Boulenger Catalogue of the Batrachia Gradientia, s. Caudata British Museum. 2d Ed. 1882, p. 79, plate 3, fig. 2.

Oedipus pennatulus Dunn, The Salamanders of the Family Plethodontidae, 1926, pp. 357, 374-376, 439, fig. 64 (*part.*); Taylor, Univ. Kansas. Sci. Bull. XXV, 1938 (1939) No. 14, pp. 293-294.

A number of specimens taken at the mountain pass about three kilometers southwest of Acultzingo have been referred to this species.

Some were found under rocks in crevices in moist clay along the edge of the old cobblestone pavement. Others were taken a few hundred feet higher in the thick moss under a lone pine tree near the summit. The behavior of the two groups of specimens was different; those taken in the moss were usually coiled in a watch-spring spiral as if imitating the spirally coiled millipeds which infest the moss and which are about the same size as the smaller salamanders. Those taken under rocks in clay were not so coiled.

In the preserving fluids, those taken in the moss seemed to become rigid and distorted at death, the musculature of the side of the head and neck appearing quite distinctly through the skin, and the posterior projection from the hyoid stands out very clearly. (See pl. III, fig. B.)

Those taken in the clay remained without distortion when preserved, showing little or no trace of the lateral neck musculature or cartilage. In these specimens the terminal part of the tail was white, which on examination proved to be due to a white parasitic worm which was just beneath the epidermis. These worms are an

immature stage in the life history of some unknown cestode. They are from two to four millimeters long. They have not been identified. No worms were found in specimens taken in the moss.

The following specimens are referred to *Thorius pennatulus:* EHT-HMS. Nos. 17731-17786; 17788-17793.

The two lots of material from this same general locality are somewhat puzzling.

They differ in the amount of pitting on the head, those from the moss being almost wholly smooth save behind eye and on neck. These specimens likewise have the vomerine teeth set on a higher ridge and the deep groove from below eye intersects the mouth at a point slightly farther forward. These may represent two distinct species, but I feel that further study on live material is necessary

FIG 5. *Thorius pennatulus* (Cope) EHT-HMS. No. 12141; Acultzingo, Veracruz; foot and hand. ×6.

to determine this point. The types are apparently lost and new topotypic material must be obtained to deal satisfactorily with these diminutive salamanders.

I have examined the specimens in the U. S. National Museum referred to this species. All are old and for the most part badly preserved. Certain ones I believe belong to different species.

USNM No. 47608 Cerro de San Felipe, Oaxaca, apparently belongs to *Thorius narisovalis* sp. nov. (A description of this specimen is given by Dr. E. R. Dunn, "The Plethodontidae," p. 375.) No. 47797 Reyes (Oaxaca?), Mexico, with an elongated oval nostril; is apparently a specimen of *Thorius pulmonaris* sp. nov.; No. 25101, Mirador, Mexico, is broken in several pieces, the head is mutilated and the limbs missing. I cannot identify it certainly with any species. Nos. 30348-30349 Tehuantepec, Sumichrast Coll. are two fragmentary specimens, at least one of which, represented by a head, belongs to a species having the "sharp snout." If this specimen actually originated in Tehuantepec it is likely that it is an undescribed form, perhaps related to the sharp-nosed salamanders

of Central and South America. The British Museum specimens listed by Dunn (*op. cit.* p. 439) from Cerro San Felipe, Oaxaca, may likewise be referable to another form.

The specimen figured by Boulenger (*loc. cit.*) if correctly drawn, cannot belong to the species at hand; the dark lateral band, whitish-margined above, and the absence of the deep groove from below eye to mouth, strongly suggests another species.

Thorius narisovalis sp. nov.

(Plate XLVII, fig. 3)

Type. EHT-HMS No. 17859; collected at an elevation of about 2,600-3,000 meters on Cerro San Felipe, 15 km. north of Oaxaca, Oaxaca, August 18-22, 1938, by Edward H. Taylor.

Paratypes. EHT-HMS Nos. 17794-17858; 17860-17870; same date, locality and collector.

Diagnosis. A diminutive species related to *Thorius pennatulus*, but differing in being larger and in having the dorsal part of head covered with relatively large pits; the groove below eye normally intersects the line of mouth slightly posterior to the posterior corner of the eye. No teeth on maxillary. Fingers and toes better developed, with a greater degree of independence, than *pennatulus*.

Description of the type. Adult female. Head not wider than the body, and less deep; the distance between the orbits less than the width of a single eyelid; nostril oval about .56 mm. in greatest diameter, its distance from the extreme tip of snout equal to less than half diameter; length of eye 1.45 mm.; a very minute fold back of eye under which the posterior part of eyelids terminate; length of eye greater than length of snout (1.3 mm.); occipital region rather flat, with slight depressions next to orbits; a groove behind eye continues to near the nuchal groove; a strong groove below eye intersects the line of mouth behind posterior corner of eye; snout somewhat narrowed anteriorly, but not "sharp" or "pointed"; subnarial swellings prominent for a female; snout projecting very moderately beyond mouth; line of mouth diagonal, angulated near narial swelling and at point of intersection with the subocular groove; a strongly defined transverse groove crosses throat and up across sides of head to dorsal surface; a groove, in the form of an arch on chin, which rests on the transverse groove; a strong nuchal fold across throat which continues diagonally backward across the side of neck to near dorsal surface where it is again directed transversely but fails to completely cross the medial part of the dorsal surface; on the side of the neck there is an elongate fold,

or ridge, which terminates posteriorly at the groove from the nuchal fold; behind this the posterior hyoid extension makes a prominent raised fold which continues to the second costal groove, the cartilage itself terminating before this point; 13 costal grooves, 12 folds; 33 folds from hind legs to tip of tail; tail constricted at base, more or less circular proximally then laterally compressed distally; a more or less distinct median dorsal groove present on body; adpressed limbs separated by six costal folds; fingers in the following increasing order of size, 4, 1, 2, 3; the toes, 5, 1, 2, 4, 3; only extreme tip of first finger free, while the two middle fingers are free for nearly half their length beyond metacarpals; extreme tip of first and fifth toes free; three middle toes free for about half their length beyond metatarsals; terminal pads on tips of digits moderately prominent. Tongue boletoid, free, a sublingual fold; three premaxillary teeth not piercing the lip; no maxillary teeth; vomerine teeth four on each side, on a strongly elevated narrow ridge; choanae small, no wider than the narrow, deep grooves emerging from them; 19-20 mandibular teeth; parasphenoid teeth in a single group narrowed greatly anteriorly, widened posteriorly without or with only a very slight posterior median notch, separated from vomerine teeth by a distance equal to the vomerine series. Dorsal and lateral regions of head strongly pitted; dorsal surface of body with the pitting less distinct; a slight wrinkling on the sides between the costal folds; tail pitted and with slight corrugation; smooth or dimly pitted on ventral surfaces.

Coloration. Reddish-brown on entire dorsal surface of body and tail; sides blackish, head dark; venter lighter, gray-brown, with a few cream dots; the dorsal and lateral markings rather strongly contrasted in life, but in preservatives are indistinct unless submerged in water.

Measurements in mm. Type, 17859; largest female, 17819; and largest male, 17854, respectively. Snout to posterior end of vent, 28.8, 31, 27.5; tail, 32.5, 40 (estimated, the tail broken and regeneration begun), 35; snout to arm, 7.8, 8, 7.5; axilla to groin, 16.8, 17.5, 16; arm, 4.3, 4.8, 4.3; leg, 4.6, 5.3, 4.8; width of head, 4.2, 4.5, 4; snout to nuchal fold, 5, 5.6, 5.15.

Variation. Adpressed limbs are separated by from four and one-half to six folds, the larger number being in larger females; the lower, in smaller males. In color some of the females are blackish above, lacking the dorsal reddish-brown mark. A few have tiny

orange-brown stripes on each side of the medial line with a separate nuchal spot.

In many specimens the subnarial swellings of females were as large as in the males. In larger males from one to three of the premaxillary teeth pierce the lip. In most of the specimens the lateral grooves of nuchal fold meet on the middorsal line. The number of segments on tail varies between 22 in the smallest specimen (15 mm. snout to end of vent), to 36 in a large female (29.5 mm. snout to end of vent). One case showed the groove, from nostril to lip, cut completely through the lip to choana.

Remarks. The specimens of this species were found under the bark on fallen trees together with *Bolitoglossa smithi* and *Bolitoglossa unguidentis* from the same locality. Only one or two were found on the ground under logs. *Thorius pulmonaris*, the other representative of the genus *Thorius* found on San Felipe, was invariably found in wet leaves on the ground, but at a lower elevation than the other species mentioned. The *Thorius narisovalis* were more active than the other species, usually starting for cover when they were exposed by the removal of the bark. When touched they would jump or throw themselves from the log to the ground and hasten to ensconce themselves under leaves or other debris. At no time did I find them passive or coiled.

Ambystoma bombypella sp. nov.

(Plate XLV, fig. 1)

——— Taylor, Univ. Kansas Sci. Bull., XXV, 1938 (1939) pl. XXIV, fig. 1.

Holotype. EHT-HMS No. 3997, collected near Rancho Guadalupe, 14 km. east of San Martín, (Asunción) México, by Edward H. Taylor.

Paratype. EHT-HMS No. 3998, collected same date and locality by Hobart M. Smith; No. 18896, 15 km. W. of Morelia, Michoacán; E. H. Taylor, collector.

Diagnosis. A medium-sized salamander with eleven costal folds; limbs overlapping more than length of hand when adpressed; a pair of metatarsal tubercles and a pair of metacarpal tubercles; tail thickened, strongly compressed, lacking a dorsal fin; fingers and toes without webs, or at least not extending beyond the metatarsals and metacarpals; tongue large, lamellae radiating somewhat; vomero-palatine tooth series broken, the vomerine series forming a median angle which reaches in advance of choanae; color brownish above, light brownish-white below.

Description of type. Head low, the line of the mouth forming a slightly sigmoid line; length of eye less than its distance from nostril; interorbital distance slightly less than length of snout; distance between nostrils less than interorbital distance; eyelid in interorbital distance three and one-half times; a slight groove behind eye can be traced back to end of the gular fold; a vertical groove crossing angle of jaw barely indicated; gular fold present; tongue broad, the lamellae radiating forward; choanae large, the diameter of one contained in the distance between them, four and one-half times.

Palatine teeth 12-10, not reaching forward to the level of the middle of choanae; vomerine teeth 15-17, the series forming a broad angle not or but scarcely separated medially; a circular depression in middle of palate about half diameter of a choana; maxillary-premaxillary teeth 56-54; mandibular teeth about 60-60; 12 costal grooves, 11 folds; no splenial teeth; limbs well developed, overlapping length of hand (in paratype, to elbow); digits flattened, terminating in fine rounded points with a very slight terminal deposition of horn; phalangeal formula of fingers, 2, 2, 3, 2; of toes, 2, 2, 3, 4, 2.

Skin rather shiny or silky in appearance due to very fine reticulated striations; head with a few enlarged pits above and anterior to orbits; trace of the lateral line organs on body dimly discernible in type (more so in the younger ? paratype).

Measurements of type and paratype in mm. Nos. 3997, 3998; sex, ♀, ♀; snout to vent, 81, 67; tail, 61, 52.3; snout length, 8.4, 5.8; snout to gular fold, ventral, 20.2, 17; snout to arm insertion, 28.5, 23.5; axilla to groin, 36.5, 29.5; eyelid width, 2.1, 2.1; interorbital width, 6.8, 5.3; distance between nostrils, 5.5, 4.6; arm, 24.3, 22.3; leg, 26.6, 24.8.

Color in life. Above uniform grayish-brown to lavender-brown, with a faint, very narrow, median, dark line from shoulder to base of tail; a slight darker line follows the diagonal groove behind eyes; lower half of sides of body and tail light tan or brownish-white; abdomen grayish to brownish-white; chin cream-yellow.

Variation. A single paratype, somewhat smaller than the type, agrees in most characters. The color above is somewhat more lavender and the tail shows some indefinite darker spotting; the teeth are as follows: maxillary-premaxillary, 41-38, the series not extending so far posteriorly as in type; mandibular teeth about 48-48; vomeropalatine series, $7 + 14$, $-7 + 16$, the vomerine groups forming a curving series slightly broken medially; the depression in the palate

is very much wider and shallower; there is no trace of a dark line behind eye.

Remarks. The type and paratype were taken on a hillside near a small permanent artificial pond. They were under rotting logs. In the immediate vicinity I also found the single type specimen of *Ambystoma schmidti* Taylor, a species, if one may judge by the teeth, related to *Ambystoma texanum* (Matthes). The form here described is related to the *tigrinum* group, but may be readily distinguished by the fine texture of the skin, and coloration. While resembling *Ryacosiredon* in certain characters, the absence of larval dental characters precludes an association with this genus.

Ambystoma amblycephala sp. nov.

(Plate XLV, fig. 2)

Type. EHT-HMS No. 16443, ♀, 15 km. west of Morelia, Michoacán. September 10, 1938; E. H. Taylor, collector.

Paratypes. EHT-HMS No. 16442, 16444. Topotypes.

Diagnosis. A rather large species with 11 costal grooves; caudal fin tending to disappear save for a fine ridge; web between metatarsals and metacarpals distinct; fingers free to a point near distal ends of the metacarpals; metatarsals included completely in web; phalanges free, fingers and toes with a slight fringe; limbs overlap distance equal to hand; 31 to 37 palatine and vomerine teeth on each side; teeth more or less bifid, in a low-arched transverse series; 70-80 maxillary-premaxillary teeth, in full-grown adults, on each side; mandibular teeth about same; lateral edges of tongue free.

Description of the type. Head longer than broad, much more than twice as wide as deep. Distance between eyes (7.2 mm.) less than length of snout (8.2 mm.); length of orbit (4.1 mm.) less than distance to nostril; nuchal fold distinct; a transverse groove across jaw angle. Maxillary-premaxillary series of teeth 72-70, the teeth extending some distance behind the level of the palatine teeth; mandibular teeth about as numerous; palatine and vomerine teeth in a practically continuous series on a transverse elevated ridge, which forms a very slightly elevated arch, the most anterior teeth not reaching the anterior level of choanae; about 67 teeth altogether, the tips brownish; palate with a broad, shallow medial groove, with a rounded cavity posteriorly in which the openings of the mucous glands are discernible; tongue lamellate, the plicae running longitudinally, the edge free laterally.

Skin of head with minute pits, and a few large pits on each side between orbits and running forward; and another scattered series of

large pits more or less surrounding lower part of orbit; no traces or only dim traces of the lateral line system on body. Adpressed limbs overlap length of hand; digits webbed between metacarpals and metatarsals, the web failing to reach the ends of metacarpals but completely includes the metatarsals; a very slight fringe on the sides of the digits, the tips more or less covered with a horny deposit; two metacarpal tubercles and two metatarsal tubercles; tail lacking a dorsal fin save for a slight dorsal ridge; tail as long as body, excluding head.

Color. Above, blackish; below, gray with a series of ventrolateral cream spots; the median ventral region a little darker. Breast and throat with some cream markings. Sides of the proximal part of tail of lighter color than distal part.

Measurements in mm. Nos. 16443, 16442, 16444; sex, ♀, ♀, ♀; snout to posterior end of vent, 90, 93, 64.5; tail, 71, 60, 47; width of head, 17.5, 16.5, 13.5; length of head, 18.5, 20, 16; snout to nuchal fold, 22, 22, 16.2; snout to arm, 28, 30, 27; leg, 30, 33.2, 27.1.

Remarks. All three specimens are slightly shriveled, due to having been preserved some time after death. Normal condition of the surface of the body is somewhat uncertain. The smallest specimen has a smaller number of maxillary and mandibular teeth, as is true of the young of many species, the series increasing posteriorly in older specimens as the jaw grows. The vomerine teeth form a higher arch, the anterior teeth reaching farther forward than the anterior level of the choanae. The two paratypes do not have the series of cream spots as pronounced as in type and the tails are somewhat more slender, darker, and the dorsal fin is somewhat more prominent in the younger specimen. The larvae are unknown.

From *Ambystoma bombypella* the species differs in color (probably also in skin texture) and in having a very much greater number of jaw teeth. The arrangement of the vomero-palatine series is different. In *bombypella* the palatine teeth are separated from the angular vomerine series.

From *Ambystoma ordinaria* it differs in having nearly double the number of teeth in the adults, and likewise differs in the number and arrangement of the vomerine and palatine teeth. The webbing extends between digits to the base of the metacarpals and metatarsals, which is not true in *ordinaria*. I have compared these three forms with transformed *Siredon mexicana* from which all differ in shape of head, skin character, body proportions. A figure of that form is included for comparison.

Ambystoma ordinaria sp. nov.

(Plate XLVI, figs. 1, 2, 3)

Type. EHT-HMS No. 16367, adult female, collected in a small stream at an elevation of about 9,000 feet, four miles west of El Mirador near Puerto Hondo, Michoacán, September 2, 1938. E. H. Taylor, collector.

Paratypes. EHT-HMS Nos. 16364-16366, 16367A, 16368-16370, 16372-16382, 16384-16386. Taken same place, September 2 and 3, 1938. Same collector.

Diagnosis. A rather large salamander with eleven costal grooves from axilla to groin; limbs, when adpressed, overlapping a distance equal to length of hand, or arm to elbow; digits unwebbed, free as far as from one-third to one-half of the metacarpals and metatarsals; caudal fin persistent, tips of digits more or less covered with horn; premaxillary-maxillary tooth series 39-46 on each side of jaw; 9 to 11 palatine teeth more or less separated from the vomerine series which is either in a single curved series or divided into two diagonal groups. Adults uniformly grayish-black above, somewhat lighter laterally and on belly.

Description of type. Head longer than broad, and much wider than deep; distance between the eyes (9 mm.) greater than length of snout (7.3 mm.); length of orbit (5 mm.) equal to distance to nostril; maxillary-premaxillary teeth, 47-42, the teeth extending back to the posterior level of the palatine series; the individual teeth directed mesially; palatine teeth in a group of 10-12 on each side, separated from the vomerine series by a diastema; about 27 teeth in the vomerine group, which is continuous and curving; mandibular teeth, 48-48; many of the teeth in both upper and lower series slightly bifid; tongue large, lamellated, the plicae running longitudinally; tongue free on sides.

Body about as deep as wide; head much wider than deep; arm rather short, failing to reach beyond tip of snout; digits tipped with horn, in the following order of size: fingers, 1, 4, 2, 3; toes, 1, 5, 2, 3, 4; two palmar (metacarpal) tubercles; a pair of metatarsal tubercles. Skin on head minutely corrugated and pitted; traces of the lateral-line organs on head and body inconspicuous or absent.

Color. Grayish-black above, nearly uniform; grayish on sides and venter; tips of digits blackish-brown.

Measurements in mm. Nos. 16367, ♀, 16366, ♀, 16365, ♂, snout to posterior end of vent, 86, 80.5, 68.7; tail, 76.1, 71, 60; width of head, 18.8, 17, 15; length of head, 24, 21.2, 19; depth of head, 11.8,

11, 8.3; snout to nuchal fold, 19.8, 18, 16; snout to arm, 29.2, 25.5, 21.5; axilla to groin, 38, 37.5, 28.2; arm, 26, 24.2, 24; leg, 29.2, 25, 24.

Variation. In general appearance the two adult paratypes are similar. In both, however, the third toe is slightly longer than the fourth, instead of shorter, and traces of the lateral line organs persist as a series of minute openings which are slightly elevated and which are frequently white in color; these are confined to the lateral and ventro-lateral rows, the latter continued on the breast.

In No. 16366, ♀, a few spots are also visible in the dorso-lateral row.

The male (No. 16365) has an enlarged, flattened cloacal gland. As is typical of the males of most salamanders this specimen has longer limbs, the adpressed limbs overlapping nearly to the elbow. In all the specimens the caudal fin is only slightly narrower than the fleshy part of the tail.

Larvae. In the larval specimens, all collected with the type in a tiny stream, near its headwaters, I find two groups of larvae which I interpret as normal and neotenic forms. The entire series ranges from tiny specimens 25 mm. (snout to posterior part of vent) in length, to the large neotenic forms 87 mm. long. The specimen having the greatest length contains fully developed eggs in the ovaries which are equally as large, and similarly colored to those present in the type specimen.

The younger larvae have the lateral line organs in three series, a dorsolateral, a lateral, and a ventrolateral, the last continued onto the breast. These are usually conspicuous due to the presence of white or cream spots about their external openings. In many larger and some of the smaller larvae the light spots are wanting. In some of the larvae the tails are longer than head and body.

Another variation is evident in the vomerine series. Part of the longer and shorter tailed forms have the teeth in a continuous arch; and part have the series distinctly divided. This variation is evident too in the transformed specimen. The type, a female, differs from the other adult male and female. The adults were taken under water with the larvae.

Two larval specimens are figured with the type. It is possible the type transformed from a neotenic specimen, the two other adult specimens from subadult larvae. In the very young larvae (25 mm.) the dorsal fin extends to the shoulders but it has disappeared on body when the larvae have reached about 40-45 mm., the caudal fin terminating abruptly near insertion of the hind legs.

The differences between this form and *Ambystoma amblycephala*

are discussed under that form; from *bombypella* it differs in the character of skin, coloration and the arrangement of the palatine and vomerine teeth.

I am not certain whether the small stream in which the specimens were found, empties into the drainage system of the Balsas river or that of the Lerma (Rio Grande) river. The elevation was about 9,000 feet, and may be near the divide between the two systems.

Siredon mexicana (Shaw)

(Plate XLV, fig. 3)

Gyrinus mexicanus Shaw, Naturalist's Miscellany Vol. 9, 1798, pls. 343, 344.
Siredon humboldtii Duméril and Bibron, Erp. Gén., Vol. 9, pp. 176-181.
Ambystoma mexicanum Lafrentz, Abh. Ber. Mus. Natur-Heimatk. Natur. Ver. Magdeburg, Bd. VI, Heft 11, 1930, pp. 95-105, pl. II, fig. 1; Wolterstorff, *op. cit.* pp. 135-138, figs. 4, 5.

This species, the form of *Siredon* longest known, appears to be confined, normally, to certain lakes and swamps of the Valley of Mexico. A series of ten were purchased at Lake Xochomilco in 1938. These are EHT-HMS Nos. 18946-18955.

Description. A large neotenic salamander with head broader than long. The maxillary-premaxillary teeth vary from 42-51 on each side of jaw, the teeth extending slightly behind the posterior level of choanae; mandibular teeth 48-52 on each side, the posterior teeth of the series somewhat enlarged; palatine teeth in straight, nearly parallel series, containing from 8 to 16 teeth, the smaller number in the older specimens; vomerine series consist of from 24 to 32 teeth on each side, the series directed diagonally forward, but are separated medially by a distance somewhat less than half the length of a single series. The teeth are often arranged in short diagonal rows rather than in a serial line; vomerine teeth separated from the palatine by a diastema; 28 to 38 splenial teeth, the posterior teeth arranged in short diagonal series of three or four teeth. The smaller numbers are in the older specimens. (In very old specimens it may be that most of the splenial teeth are lost or covered by the gums.)

Skin moderately smooth, the pitting on head and body rather indistinct or obsolete in most cases, the head occasionally with a few small craterlike pits; occasionally the skin has a slightly granulated appearance. The dorsal fin inserts anteriorly at a point more than a centimeter behind the posterior gill insertion; anteriorly the fin is a little more than a low fold, but on tail it rises to a height of several millimeters; tail sharply pointed at distal end; limbs, when adpressed, overlapping about the length of the foot, or less in females filled with eggs; digits including the distal part of the

metatarsals and a still larger part of the metacarpals, free, the digits flat and pointed. A pair of metatarsal tubercles and a pair of metacarpal tubercles normally present, but one or another may be absent. Males have an enlarged cloacal gland, which is reduced in females.

Measurements in mm. Largest male, 18954, largest female, 18950; snout to posterior end of vent, 132, 125; tail, 95, 85; snout to arm, 43; 45; axilla to groin, 58, 62; width of head, 33, 37; length of head, 44.4, 45; arm, 36, 38; leg, 40, 38; nuchal fold free, 8, 10.

Transformed adult. (Field Museum Natural History No. 19179.) I do not have the history of this specimen. The label states "Mexico City, Mexico, Coll. Emil Witschi, July 1933." Mr. Karl Schmidt states that he believes that the specimen was artificially transformed.

This specimen is squat, the body short, plump, and the head very short and wide. The tail is much shorter than head and body; distance between the eyes (10.2 mm.) distinctly longer than snout (7.4 mm.); a few faint traces of pits are discernible; nostrils rather narrow, elongate, the distance between them greater than their distance from the eye.

Maxillary-premaxillary teeth 63-63; palatine teeth 7-7 on each side in a nearly straight, transverse line; vomerine teeth about 11-13, the series tending to form a very broad angle, but with a slight diastema medially; a median well-like cavity in the palate; choanae rather large; tongue large, the lamellae parallel for the most part; about 60-60 mandibular teeth.

Digits rather short, pointed, free on foot to near the distal end of the metatarsals, on hand, the distal tip of the metacarpals free; a well-developed inner metacarpal tubercle, the outer apparently wanting; a strong inner metatarsal tubercle, the outer barely indicated; digits in the following ascending order of size: fingers, 1, 4, 2, 3; toes, 1, 5, 2, 4, 3; adpressed limbs overlap the length of foot; 11 costal folds. Tail strongly compressed without trace of a membranous fin; dorsally skin smooth, but on sides of head and body, as well as on tail, it is granular.

Deep brown on dorsal surface of head, dorsal and half of the lateral region of body and on tail; yellowish, low on sides and chin; muddy yellow on abdomen. The body above and below with scattered large black spots; tip of digits light.

Measurements. Snout to posterior end of vent, 87.5; tail, 67.2; snout to foreleg, 29; axilla to groin, 45; width of head, 25.2; length of head, 27; snout to nuchal fold, 20.2.

Siredon dumerilii* (Dugès)

Siredon Dumerilii Dugès, La Naturaleza I, 1879-1880, pp. 241-244, pl. V, figs. 1-12. Type description; type locality, Pátzcuaro, Michoacán; Ann. Sci. Nat. (5) Zoöl. Ser. V. 15, Art. 17, 1887, 2 pages; Cope, Bull. U. S. Nat. Museum No. 34, 1889, p. 84; Velasco, La Naturaleza, IV, 1879, p. 215.

Ambystoma tigrinum (part) Günther, Biol. Cent. Amer. Batr., Dec., 1901, p. 295; Boulenger, Cat. Batr. Grad. s. Caud. Batr. Apoda British Mus., 2 ed., 1882 p. 43-45 part.

Ambystoma dumerili Lafrentz, Abh. Ber. Mus. Nat. Heimatk. Nat. Ver. Magdeburg, Band VI, Heft II, 1930, pp. 92-94, pl. III, fig. 2; Wolterstorff, *op. cit.* pp. 139, text figs. 6, 7, 8, 9, 10.

This very striking species is known only from Lake Pátzcuaro, Michoacán. It is unknown in a transformed state.

Diagnosis. A large perinnibranchiate; reddish-violet mixed with brown, much lighter below. Body short, flattened somewhat; head much flattened; 12 costal folds; four gill openings; three gills; adpressed limbs overlap the length of foot; ventral fold on neck free medially for 5 mm; large number of shallow crater-like pits on head, neck and to a much lesser extent elsewhere on back, sides, and venter, giving surface a somewhat corrugated appearance; fingers united by a web involving proximal phalanx.

Description. USNM. No. 16201. (Reputed to be from Guanajuato, México, Dugès, collector. It is possible that this specimen may have actually been before Dugès when he described the species. He designates no type. It seems certain that this specimen originated in Lake Pátzcuaro and was sent to the U. S. National Museum from the Guanajuato locality by Dugés.)

Head broad and flat, its length about a fifth longer than broad; to edge of the "ventral fold" 29 mm. Ventral fold has a free edge medially for about 5 mm., maxillary-premaxillary tooth series 64-63 (counting an occasional missing tooth); palatine teeth 24-23, vomerine teeth, 37-38; the vomero-palatine series nearly continuous on the left side, the two series separated medially by a short distance; about 50-48 splenial teeth; mandibular teeth 70-89.

The dorsal fin arises about 10 mm. back of the level of arm insertion; on body, it is very low, but on the tail reaches a height of 6 mm. above, and about 3.5 mm. below tail. The maximum width of the tail near base is 16 mm. including fins.

The webbing on foot includes the first (proximal) phalanx of each toe, the toes terminating in points; a small inner metatarsal tubercle, the outer if present is not discernible; a small inner metacarpal tubercle; hand with the web extending slightly farther than on toes; the pits on the dorsal, lateral, and ventral part of head are conspicuous, giving the head a corrugated appearance in the occipital

* After this paper went to press, a new genus, *Bathysiredon,* was proposed for this species.

region; region back of nuchal fold likewise pitted and corrugated; a few scattered pits evident on body.

Color. The specimens are faded so that the general color is dirty creamy white. In life the color was probably reddish-violet.

Measurements in mm. USNM. Nos. 16201, 16202, 53361, respectively; snout to anterior end of vent about 123, 140, 111; tail, 86, 102, 97; axilla to groin, ?, 68, 57; arm, ?, 49, 37; leg, ?, 36, 48; head width, 40, 44, 30; head length, 50, 54, 40; distance between eyes, 17, 18, 14; between nostrils, 11, 10, 9.

Variation. In the smallest specimen USNM. No. 53361, the tooth formula is: maxillary-premaxillary teeth, 46-54; palatine, 15-13; vomerine, 46-36; splenial, 48-48; mandibular, 65-70. In this specimen the small outer metacarpal tubercle is present.

Siredon lermaensis sp. nov.

(Plate XLVIII)

Type. EHT-HMS No. 22578, Lake Lerma, east of Toluca, México, September 16, 1939, by E. H. Taylor and H. M. Smith (purchased from fishermen); adult.

Paratypes. EHT-HMS No. 22586, topotype, adult; 15436-15440; 22571-22586 topotypes; larvae.

Diagnosis of adult. A large salamander; the body somewhat compressed; gray-black to black above and below; about 60 maxillary-premaxillary teeth on each side; vomero-palatine series continuous, forming a broad angle (failing to meet by a narrow space), about 20 on each side; head much longer than wide; tongue laterally with black pigment; limbs overlap length of hand; tail length equal to distance from gular fold to anus; low, thin fin on tail; toes not webbed; 11 to 12 costal folds; skin of throat folded.

Diagnosis of larva. A large (often neotenic) larval type, four gill slits, three gills; 12 costal folds; dorsal fin originating on back of head, anterior to posterior level of gill origins; limbs overlap a distance greater than length of hand; digits not webbed; the membranes between the metacarpals and metatarsals not or but slightly excised; metatarsal and metacarpal tubercles; about 50-60 maxillary-premaxillary teeth on each side of jaw; vomero-palatine series 30-12, the smaller number being on the palatine; a series of teeth on the splenial; body strongly compressed, the surface glands on body enlarged giving a granular appearance.

Description of type. Head large, its length (34 mm.) nearly 1.26 times the width (27 mm.); length of snout, 9 mm.; interorbital

distance, 10.2 mm.; length of orbit, 6.5 mm.; distance between nostrils, 8.5 mm.; a strong constriction (groove) behind head with a somewhat thickened region in front on sides, a continuation of the gular fold which crosses the back of throat; skin of chin with longitudinal folds; a groove below eye marking the thickened fold at corner of mouth; mouth narrow, the angle of the opened mouth not reaching much beyond middle of eye; maxillary-premaxillary tooth series (counting an occasional missing tooth), 128, about half of this number on each side; about 138 mandibular teeth; vomero-palatine series beginning behind middle of choanae and running diagonally forward to middle of palate, forming an obtuse angle, failing to meet opposite series by a space equal to diastema between two teeth; choanae small, widely separated; no trace of splenial teeth; anterior part of tongue lamellate or plicate, the plicae tending to radiate; sides of tongue pigmented. A deep median pit on palate.

Skin generally smooth, but in parts it may appear slightly granular especially on sides; eleven rather distinct costal folds, the axillary and one following not clearly discernible; anal region somewhat swollen, the walls of the cloaca papillate; tail fin low; not reaching to point above vent; a series of enlarged pits about eyes extending on to snout, and temporal region.

First finger shortest; second and third equal (right hand) or third longer (left hand); fingers slightly flattened, pointed, the web between metacarpals slightly excised; metacarpal tubercles rounded, flattened; toes flattened the tips pointed, the web between the metatarsals slightly excised; fourth toe slightly longer than third.

Measurements of type and larval paratypes in mm. Nos. 22578, 15437, 15439, 15438, 15440; sex, ♂, ♂, ♂, ♀, ♀; snout to posterior end of vent, 130, 135, 128, 113.2, 87.5; posterior end of vent to tip of tail, 99, 116, 109, 80, 75.3; depth of head, 19, 25, 25, 23.5, 17.5; depth of body, 29, 28, 32.1, 36, 21; depth of tail, including fin, 20, 40, 34, 31, 22; width of head, 27, 35.5, 30.4, 30, 21.5; snout to opercular flap (or gular fold), 28, 31.5, 27, 26.8, 23.5; arm, 30, 38.4, 36, 35.5, 31; leg, 41.3, 47, 42.5, 35.5, 29; axilla to groin, 59, 57.5, 51, 54, 57; snout to arm insertion, 45, 48.4, 43, 40, 30.

Color. Nearly uniform gray-black above and below; the tips of the digits gray-cream; lips lighter than head; under the lens the body is regularly peppered with minute cream dots.

Description of larva, No. 15437. Body strongly compressed as high or higher than wide; width of the head about equal to the distance between snout tip and the posterior edge of the opercular

fold; distance between eyes (13.5 mm.) greater than distance between nostrils (11.2 mm.); depth of head (25 mm.) more than half the length of head (from tip of snout to the base of last gill, 44 mm.); large pits on head, about eyes, the angles of the jaws, and to a lesser extent on snout, discernible but not conspicuous; dorsal, lateral, and ventral sides of the body, and sides of tail granular; the summit of each granule with a minute pit.

Dorsal fin arising on the back part of head, continuing as a low, somewhat thickened fold along the back, rising to a height of six millimeters between hind legs, and on tail to a maximum of about ten millimeters; cloacal region (male) greatly swollen, the walls thickened and heavily papillate; adpressed leg reaches the elbow of the adpressed arm; fingers flattened, terminating in points; a slight web is evident between the distal ends of the metacarpals and metatarsals, and sometimes suggesting a slight fringe along the side of digit (if the digits are slightly dessicated); an inner and an outer metacarpal tubercle; similar metatarsal tubercles; the edge of the opercular fold is free for 15 millimeters on the median ventral line; eleven costal folds (12 grooves), between axilla and groin.

Maxillary and premaxillary teeth about 60-60; vomero-palatine tooth series practically continuous (12-36; 12-33), slightly diagonal, arching anteriorly, but separated medially by a distance less than one-sixth the distance between the choanae; mandibular teeth about 60-60; splenial teeth about 16-16 with a rather large hiatus in the middle of the series.

Color in life. Deep purplish-black. The summit of the granules light; the corners of the mouth, and the tips of the digits lighter.

Variation. The measurements given above show age and sex variation. The smaller paratypes are more or less lavender above and often somewhat creamy lavender below. The lateral line organs may have lighter spots about them, and the throats may be dirty cream. In some of the smaller specimens the teeth may be somewhat irregular and the splenial series may not have penetrated the gums. In the old, neotenic specimens most of the splenial teeth have been shed. No trace of them is present in the transformed specimens.

Remarks. The larvae of this form differs from *Siredon dumerelii* Dugès in having a much narrower, less flattened head, a more rounded snout, a deeper, more robust tail, a laterally, compressed body; the gular fold free for a greater distance on median ventral line, the pitting on the head less conspicuous; the body more robust;

no break (or a very slight one) in the continuity of the vomero-palatine tooth series, while the combined series is separated medially by a wider distance. The color is very dark, almost black.

From *Siredon mexicana* (Shaw), the species differs in having a more robust, more laterally compressed body and tail; in having the dorsal fin originating farther forward on head (in *mexicana* behind level of insertion of arms), in the lack of spotting on body, and in a smaller series of splenial teeth.

It is significant that these forms are each in a different drainage system. *S. mexicana* is connected with the Rio Panuco system to the Gulf of Mexico (formerly underground drainage?); *S. dumerilii* with the Cuitzeo-Patzcuaro system (underground); *Siredon lermaensis* with the Rio Lerma-Rio Santiago system to the Pacific.

This species is used for food. It is regularly offered for sale in the markets of Toluca and perhaps elsewhere during the fishing season.

PLATE XLV

FIG. 1. *Ambystoma bombypella* sp. nov. EHT-HMS, No. 3997; near Rancho Guadalupe, 14 km. east San Martín, Asunción, México.

FIG. 2. *Ambystoma amblycephala* sp. nov. EHT-HMS, No. 16443. Type. 15 km. west of Morelia, Michoacán.

FIG. 3. *Siredon mexicana* Shaw. FMNH. 19179.

PLATE XLV

28—2181

PLATE XLVI

FIG. 1. *Ambystoma ordinaria* sp. nov. EHT-HMS, No. 16381. Larva. Topotype. 55 mm. snout to end of vent.

FIG. 2. *Ambystoma ordinaria* sp. nov. EHT-HMS, No. 16368. Larva. (older) Topotype. Snout to vent, 70 mm.

FIG. 3. *Ambystoma ordinaria* sp. nov. EHT-HMS, No. 16367. Type. Adult female, near Puerto Hondo and El Mirador, Michoacán.

PLATE XLVI

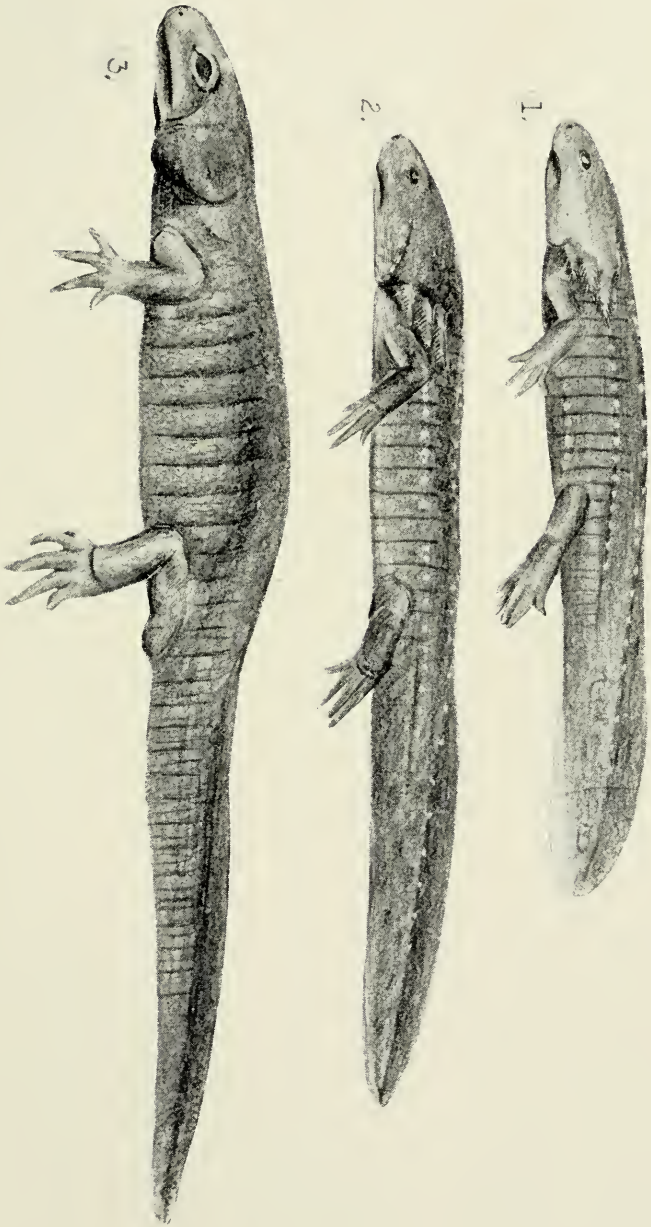


PLATE XLVII

Fig. A. *Thorius pennatulus* Cope EHT-HMS, No. 12141; two miles southwest Acultzingo, Veracruz. ×7.

Fig. B. *Thorius pennatulus* (Cope) EHT-HMS, No. 17751. ×7. Two miles southwest Acultzingo, Veracruz.

Fig. C. *Thorius narisovalis* sp. nov. Type. ×7. Cerro San Felipe, near Oaxaca, Oaxaca.

PLATE XLVII

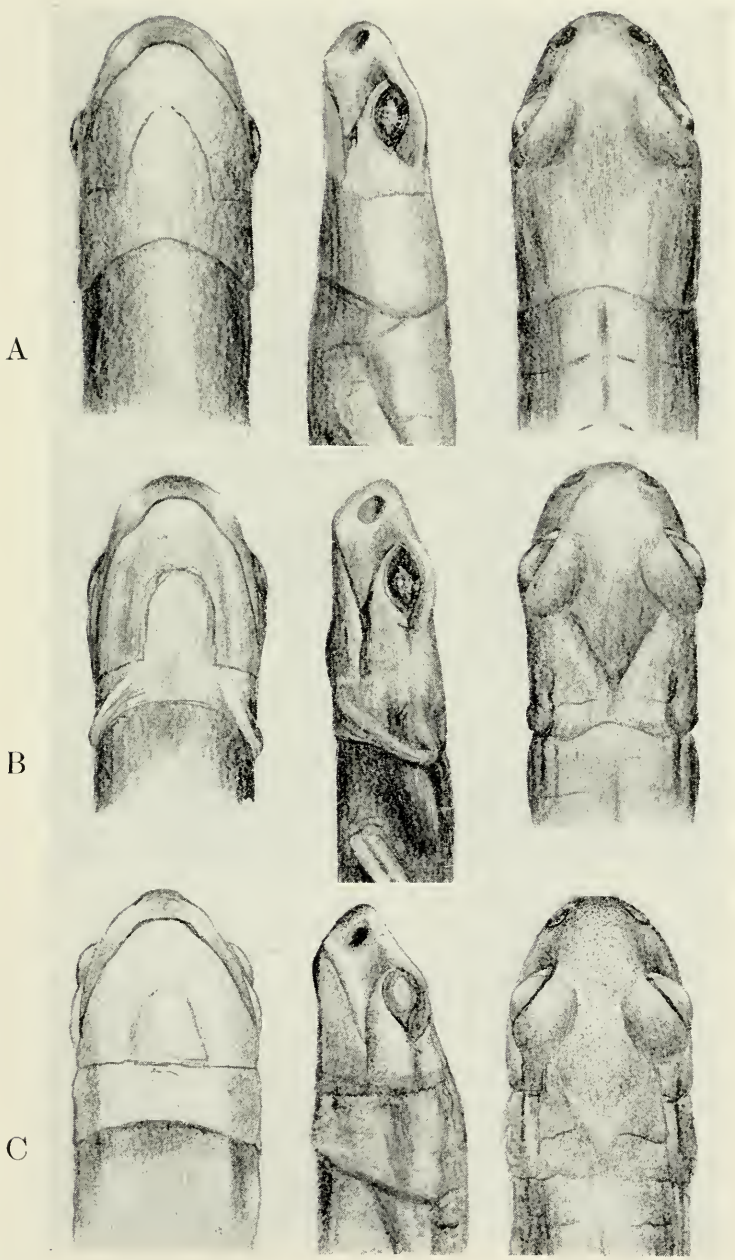
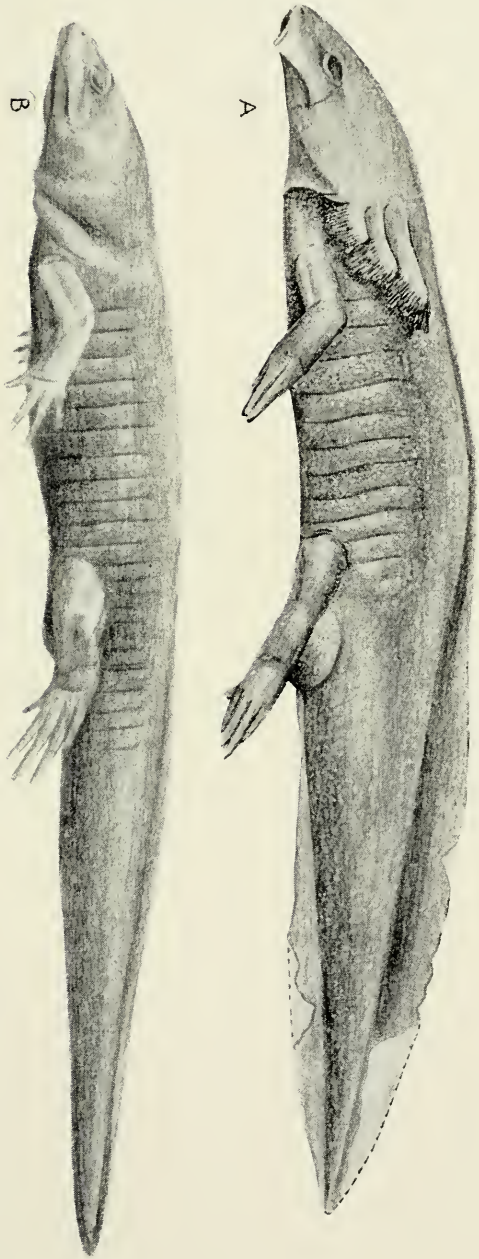


PLATE XLVIII

FIG. A. *Siredon lermaensis* sp. nov. EHT-HMS, No. 15437; Lake Lerma, near Toluca, México. A larva.

FIG. B. Same. Type. EHT-HMS, No. 22578; Lake Lerma, east of Toluca, México. × 1.

PLATE XLVIII



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Mexican Snakes of the Genus Typhlops

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ABSTRACT: There are three well-known representatives of the genus *Typhlops* in Mexico. All are known from definite localities; all are known from more than a single specimen; and all have been found by at least two different collectors. These are *Typhlops basimaculatus* Cope; *T. braminus* Daudin, and *T. microstomus* Cope. A fourth species, *Typhlops psittacus* Werner, described from a single specimen, the collector unknown (or at least not stated), and with no more definite locality data than "Mexico," belongs to a section of the genus having a sharp transverse edge on the snout, a section of the genus hitherto unknown from the western hemisphere. In consequence one is rather prone to question the label.

Typhlops basimaculatus Cope

Typhlops basimaculatus Cope, Proc. Acad. Nat. Sci. Philadelphia, 1866, p. 320. Type locality, "Cordova and Orizaba" Veracruz.

Cope described this form briefly from a specimen or specimens sent from Mexico by Sumichrast. Three years later Peters described a form *Typhlops perditus*. (Monatsb. Akad. Wiss. Berlin, 1869, pp. 430-436. Type locality, Orizaba.) Since he compares the form with *Typhlops reticulatus* I suspect that he had not seen Cope's description from which his own does not differ in any significant character. At a much later date F. Müller described a form which he designated *Typhlops* (*praelongus* n. sp.?) (*sic*) from Córdoba. He compares it with Peters' *perditus*, stating that it "steht dem *T. perditus* Peters sehr nahe, und unterscheidet sich von ihm wesentlich nur durch jede Abwesenheit einer Spur von Auge." Boulenger (Catalogue of the Snakes in the British Museum, 2d Ed. I, 1893, p. 28, and Günther (Biologia, Centrali Americana, Batrachia and Reptilia, April 1893, p. 86) refers the three above species to *Typhlops tenuis* Salvin (Proc. Zoöl. Soc. London, 1860, p. 454. Type

locality Coban, Guatemala). This latter species is described by Salvin as having 17 scale rows and no mention is made of the yellow head and yellow tail tip.

Bocourt (Mission Scientifique au Mexique; Etudes sur les Reptiles, Livr. 8, 1882, p. 499) describes and figures a form from Guatemala* which he identifies as *Typhlops perditus* Peters and which is figured as having a well-developed eye.

Thus we have a yellow-headed form in Guatemala having similar body proportions to the form described by Salvin; 18 scale rows are present about the body, as is likewise true of *perditus*, *basimaculatus* and *praelongis*.

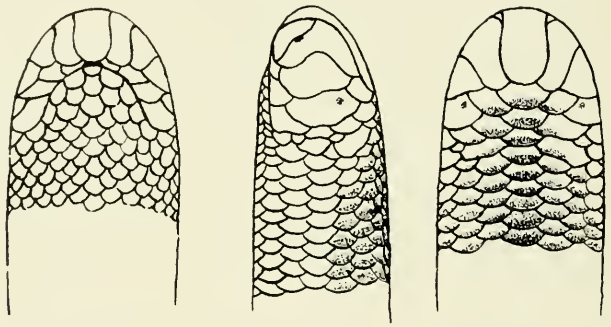

FIG. 1. *Typhlops basimaculatus* Cope. EHT-HMS, No. 5499; Potrero Viejo, Veracruz, Mexico. ×5.

While the above facts point to a possibility of a close relationship to *Typhlops tenuis* I doubt the matter is settled beyond question. In consequence I am maintaining Cope's name, knowing that it is certainly applicable to this form, and trusting that the future will offer an opportunity for the examination of the type of *T. tenuis*.

A specimen in the EHT-HMS collection No. 5499, presented to me by Mr. Dyfrig McH. Forbes, was collected at Potrero Viejo some ten miles east of Córdoba, Veracruz. It presents the following characters: Head much flattened, the thickness at anterior edge of mouth only one-half the width of head; the greatest depth of head is three-fourths the width of head; nasal completely divided, the suture arising from the first labial; four upper labials; posterior nasals not in contact behind the rostral; latter rather tongueshaped, about a fourth wider, on upper surface, than on ventral surface, not reaching posteriorly to the level of the eye; preocular large, distinctly wider than the ocular, and of slightly greater area; ocular

* He states "Mexique, Guatemala" for the source of the specimen figured; measurements from a Guatemala specimen are given.

somewhat longer vertically than the preocular; no subocular; scales following rostral a little larger than body scales; supraoculars about same size as the scale following rostral; two elongated parietal scales on each side (the anterior broken on the left side); anterior parietal separated from the last (fourth) labial by two scales, which, with the parietal and labial form the posterior border of the ocular; mental very small; three lower labials; eye represented by a small pigmented area. Scales in 18 rows throughout body. The nine ventral rows are immaculate; the dorsal rows are spotted, each spot covering (usually) parts of four scales; the yellowish reticulation between the spots not confined to the scale edges; dorsal part of snout, and sides of head to behind ocular, immaculate yellow-white; scales from rostral to tip of tail, 391; ten scales under tail.

Total length, 248 mm.; diameter of body, 4 mm.; width of head, 4 mm.; depth of head in front of mouth, 2 mm.; at eyes, 3.2 mm.; diameter of body in total length, 62.

I have compared this specimen with the type (U. S. N. M. 6602, Córdova, and Orizaba, Veracruz, F. Sumichrast), and find no significant differences. The type is more robust. The head examined under a strong lens shows scarcely a trace of the eye; the snout is a very blunt oval, nearly truncate. There are actually three lower labials. Color faded, but the pigment pattern on head is very similar to the described specimen; eight dorsal scales pigmented; remaining ten rows whitish; 385 scales, mouth to anus; 9 scales under tail; total length (about) 330 mm.; tail, 42 mm.; head width, 4.8 mm.; greatest body width, 6 mm.

Typhlops microstomus Cope

Typhlops microstomus Cope, Proc. Acad. Nat. Sci. Philadelphia, 1866, p. 125. Type locality, Yucatán, Mexico.

This species is widely separated from other described species in America by the following combination of characters: eighteen scale rows; one preocular; *one subocular separating the ocular from labial;* eye, on ocular-preocular suture, scarcely visible; lower jaw narrowed at tip; snout rounded, not hooked. "Color yellowish-olive, becoming brighter yellow posteriorly." Specimens, other than the type, are known.

Typhlops psittacus Werner

Typhlops psittacus Werner, Zoöl. Anz. XXVI, No. 693, Feb. 9, 1903, p. 248. Type locality, "Mexico."

This form is distinguishable from other Mexican forms in having a *hooked snout* with sharp side margins; the nostril on the under-

side of snout, a subocular present. The description gives 24 as the number of scale rows, while the key included in the description gives 20 rows for the species. So far as I can learn this species is known only from the type. As all forms known having a sharp snout are old world forms, one might be tempted to question the "Mexico" locality label.

Typhlops braminus (Daudin)

Eryx braminus Daudin, Histoire Naturelle Générale at Particuliüre des Reptiles, vol. VII (year XI) 1803, pp. 279-280.

Specimens of this species have been taken in southern Guerrero, in the general region near Acapulco. It is likely that it was imported from the Philippines. *Peropus mutilatus* and *Hemidactylus frenatus*, two other Philippine reptiles, have reached the west coast of Mexico.

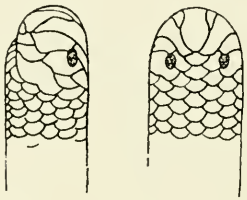

FIG. 2. *Typhlops braminus* Daudin. EHT-HMS, No. 5251; two miles south Garrapatas, Guerrero, Mexico, June 27, 1932. ×5.

The EHT-HMS collection contains the following specimens of the species: No. 5251, two miles south Garrapatas, Guerrero; elevation, 550 m.; collected by Hobart M. Smith, June 27, 1932. No. 15917, Agua del Obispo, Guerrero, June 25, 1938; No. 15918, at km. 388 near Xaltinanguis, Guerrero; Nos. 15919-15933, El Limoncito, Guerrero, about 15 km. north of Acapulco, all collected by E. H. Taylor.

All of the localities listed are less than fifty miles from Acapulco which, I suspect, was the port of entry of the species into Mexico.* The extent that it has spread suggests that the importation is not particularly recent, but probably dates to the time when the Spanish galleons carried trade between Acapulco and the Philippines.

* Since the above was written, notice of the discovery of this species in Mexico has appeared in Herpetologia, 1, No. 5, p. 44. The locality, Chilpancingo, is approximately 80 miles from the coast.

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Some Mexican Serpents

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ABSTRACT: The following species of Mexican snakes are discussed: *Loxocemus bicolor* Cope; *Loxocemus sumichrasti* Bocourt; *Natrix valida* (Kennicott); *Ninia sebae sebae* (Duméril and Bibron); *Ninia diademata* Baird and Girard; *Geophis semidoliatus* (Duméril and Bibron); *Geophis blanchardi* Taylor and Smith; *Enulius unicolor* (Fischer); *Adelphicos quadrivirgatus* Jan; *Diadophis regalis dougesii* (Villada); *Conopsis frontalis* (Cope); *Dryadophis boddaertii mexicanus* Stuart; *Dryadophis sleveni* Stuart; *Spilotes pullatus mexicanus* (Laurenti); *Elaphe mutabilis* (Cope); *Elaphe lacta* (Baird and Girard); *Elaphe chlorosoma* Günther; *Elaphe flavirufus* (Cope); *Salvadora mexicana* (Duméril and Bibron); *Pituophis deppei deppei* (Duméril and Bibron); *Pituophis lineaticollis* (Cope); *Lampropeltis ruthveni* Blanchard; *Lampropeltis triangulum nelsoni* Blanchard; *Lampropeltis triangulum annulata* (Kennicott); *Lampropeltis polyzona blanchardi* Stuart; *Lampropeltis polyzona polyzona* Cope; *Pseudoleptodeira latifasciata* (Günther); *Hypsiglena torquata torquata* (Günther); *Urotheca elapoides elapoides* (Cope); *Tropidodipsas guerrerocnsis* sp. nov.; *Sibon nebulatus* (Linné); *Trimorphodon tau* Cope; *Trimorphodon bi-scutatus* (Duméril and Bibron); *Trimorphodon latifascia* (Peters); *Leptodeira septentrionalis* (Kennicott); *Leptodeira splendida* Günther; *Tantilla bocourti* Günther; *Tantilla rubra* Cope; *Tantilla martindelcampoi* Taylor; *Tantilla calamaria* Cope; *Micrurus nuchalis* Schmidt; *Micrurus laticollaris* (Peters); *Micrurus fitzingeri* (Jan); *Micrurus affinis affinis* (Jan); *Agkistrodon bilineatus* Günther.

Loxocemus bicolor Cope.

(Figure 1)

Loxocemus bicolor Cope, Proc. Acad. Nat. Sci. Philadelphia, 1861, p. 76 (type description: type locality, La Union, Salvador). Günther, Ann. Mag. Nat. Hist. Ser. (3), 1862, IX, p. 55; and Zoöl. Record 1864, p. 123 (Identifies *Plastoseryx* (!) *bronni* of Jan with *bicolor;* Cope, Bull. U. S. Nat. Mus.; No. 32, 1887, p. 64. Bocourt, Etude sur les Reptiles, Miss. Sci. au Mexique et dans l'Amér. Cent., Livr. 8, 1882, pp. 515-516, pl. 30, fig. 5, 5a-c (*part.*). Boulenger, Cat. Snakes Brit. Mus., 2d Ed. I, 1893, p. 74-75 (*part.*). (Southern Mexico. Tehuántepec); Günther, Biologia Centrali-Americana, Reptilia, July, 1895, pp. 179-180 (Colima, Tehuántepec; Guatemala).

?Plastoseryx bronni Jan, Arch für Nat., 28 Vol. 1, 1862, pp. 242, 244-246; type description: type locality "America" ("Diese ausgezeichnete neue Art fand ich in der mir von Prof. Bronn freundlichst mitgetheilten Schlangensammlung des Heidelberger Universitäts-Museums; sie wurde, wie er mir Schrieb durch Dr. Eichler im Jahr. 1859 von einem Schiffskapitän angekauft mit anderen Schlangen, die meist Südamerikanische Sind, ohne nähere Bezeichnung des Vaterlandes derselben."); and Jan and Sordelli, Icon. Gén. Ofid., Livr. 2, 1865, p. 66; Livr. 3, pl. 1; Jan, Elenco Sist. degli Ofid; 1863, p. 20.

Loxocemus bronni Bocourt, Etude sur les Reptiles, Miss. Sci. au Mexique et dans l'Amér. Cent., Livr. 8, 1882, p. 516, t. 30, figs. 6, 6a, b.

Lacking a specific locality for *Plastoseryx bronni* Jan, the association of this species with *bicolor* is largely a guess. Bocourt, on the basis of the figure of Jan & Sordelli (*loc. cit.*), retains the species as distinct. The coloration agrees with that of *Loxocemus bicolor*

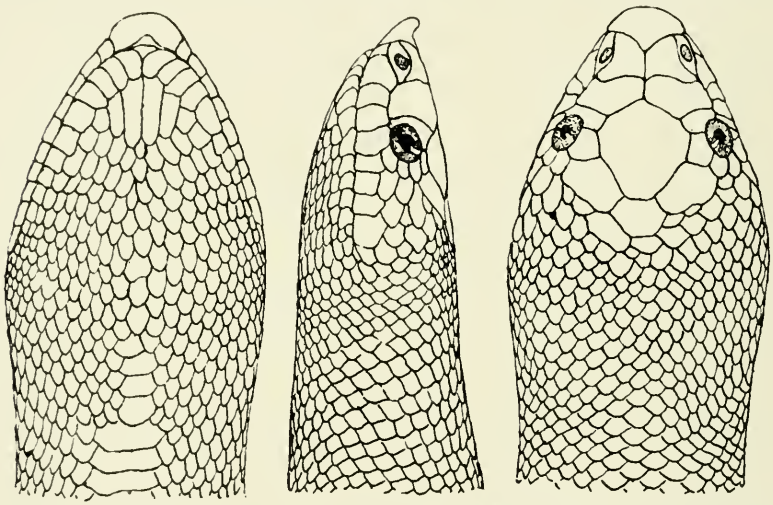

FIG. 1. *Loxocemus bicolor* Cope. EHT-HMS, No. 5501; Agua Bendita, Guerrero, Mexico. ×3. (The head has been injured and may be widened somewhat more than normal.)

Cope. The differences in squamation may be due to anomaly.

Two specimens of *Loxocemus bicolor,* a large female and a young female are in the collection (EHT-HMS Nos. 5500 near Puente de Ixtla, Morelos, km. 97.5, and 5501 Agua Bendita, Guerrero km. 185.5). These specimens have the dorsal, purple-lavender coloration clearly set off from the ventral coloration of creamy white. A slight pigmentation occurs on the inner edges of the subcaudals. These present the following scale data: Ventrals, 242, 242; subcaudals, 46, 46; scale formula, 45-34-34-34-26, 44-33-33-32-26; upper labials, 9-10, 9-10; labials enter eye, 4-4, 5-0; lower labials, 13-12, 13-12; preoculars, 1-1, 1-2 (the lower on left side minute, separating fourth labial from eye); postoculars and suboculars 4-4, 4-3; temporals 3 + 4 + 6 (3 + 6 + 5), 2 + 3 + 4.

While it is not certain that these characters will prove constant when larger series are available, these differences obtain in my specimens of *bicolor* and *sumichrasti*, respectively. Anterior chinshields are proportionally much larger while the scale adjoining outer scale is distinctly shorter than the first chinshields; in *sumichrasti* the outer scales bordering the chinshields are longer than the chinshields themselves; the first pair of lower labials are longer than in *bicolor*. The suture between the internasals is equally as long as that between the prefrontals in *bicolor;* in *sumichrasti* the prefrontal suture is one and one-half times as long as the internasal suture; rostral ridge higher in *bicolor*.

The ventrals and subcaudals of *sumichrasti* are 300, 309; of

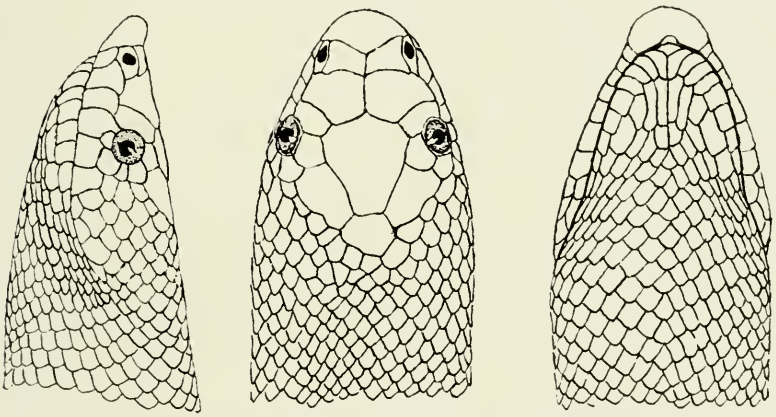

FIG. 2. *Loxocemus sumichrasti* Bocourt. EHT-HMS, No. 5502; El Limoncito, near La Venta, Guerrero, Mexico.

bicolor 289, 289. Oliver's Colima specimen, *loc. cit.*, has 289; the type of *Plastoseryx bronni* has 242 + 45 = 287.

Loxocemus sumichrasti Bocourt

(Figure 2)

Loxocemus sumichrasti Bocourt, Ann. Sci. Nat., Ser. 6, Vol. 3-4, Art. 7, 1876, pp. ——. (type description; type locality, Tehuantepec). Journ. de Zoöl. (Paris) V, No. 5, 1876, pp. 403-405. Sumichrast, Bull. Soc. Zoöl. France, 1880, p. 180.

Loxocemus bicolor Bocourt, Etude sur les Reptiles; Miss. Sci. Mex. et l'Amér. Cent., Livr., 8, 1882, pp. 515-516 (*part.*); Ditmars, Snakes of the world. 1931, Macmillan, New York, pp. 37-38, pl. 1 (Colima); Oliver, Occ. Papers Mus. Zoöl. Univ. Michigan, No. 360, Nov. 20, 1937, p. 18 (Colima); Taylor and Smith, Univ. Kansas Sci. Bull., 1938 (1939), pp. 239-240 (Guerrero).

This species described by Bocourt in 1876 was not regarded as distinct when he treated of the genus in 1882. Sumichrast, in 1880 *loc. cit.*, discussed the species, and pointed out that specimens col-

lected in the western part of the Isthmus of Tehuantepec showed marked sexual variation in color (from pure white to "*gris cendre*") and mentions that specimens from his collections sent to the Smithsonian Institution were referred by Cope to *Loxocemus bicolor*.

It appears from material in recent collections that the two forms are distinct, and the color variation is actually specific, rather than due to sexual or age differences.

Two specimens were captured from a pile of rocks near the edge of a tiny lake near El Limoncito, Guerrero, in 1938. Both are young specimens and have a heavily pigmented venter, the heads being very dark purple. These correspond in the characters of coloration reported by Taylor and Smith, *loc. cit.*, for a young specimen likewise from Guerrero. Oliver, *loc. cit.*, records a female specimen from Colima having the ventral scales "closely stippled with brown at base."

Two specimens now in the EHT-HMS collection have the following scale characteristics. Nos. 4574, 5502; yg, yg. Scale formula, 44-36-34-34-28-26, 44-34-32-32-28-26; ventrals, 256, 265; subcaudals, 44, 44; (according to Bocourt the types have 252 to 265; subcaudals 42 to 45). Preoculars, 1-1, 1-1; postoculars 3-3, 4-4, the upper part of the fifth labial is segmented on each side forming a (subocular) preocular. Labials enter eye, 4 and 5-4 and 5, 4-4; upper labials, 11-11, 11-10; lower labials, 13-14, 13-13; temporals $3 + 6 + 6$, $3 + 5 + 6$; scales between chinshields and first ventral, 13, 10.

This specimen figured is as long as the figured specimen of *bicolor*, but the head and the body are much more slender.

Natrix valida (Kennicott)

(Figure 3)

A small specimen, far out of the known range of the species, was collected at a small lake near El Limoncito, about 12 km. north of Acapulco, Guerrero, July 3, 1938 (EHT-HMS. 19224). It differs somewhat from the typical *Natrix valida* in having only a single series of well-defined lateral spots, instead of two; a wholly undivided nasal, a lower number of ventrals; nine instead of ten lower labials. The following characters obtain:

Rostral slightly visible above; internasals longer than wide, narrowed greatly anteriorly, as long or longer than the prefrontals; latter scales very much wider than long, strongly bent down over side of snout; anterior margin of frontal nearly transverse, the sides minutely concave, the widest point of scale near the posterior

end of the supraocular, rather suddenly angulate behind, a little longer than its distance from tip of snout; parietals equal to their distance from the rostral; nostril pierced in a single nasal, which is longer than high; no trace of groove or split from nostril to edge of scale; loreal small, forming an angle above; an elongate preocular wider above than below; three postoculars; temporals 1 + 2 + 3; upper labials 8-8 in following ascending order of size; 8, 1, 3, 2, 4, 7, 5, 6, four and five enter orbit (a tiny scale segmented from anterior end of first temporal on right side); two pairs of chinshields sub-

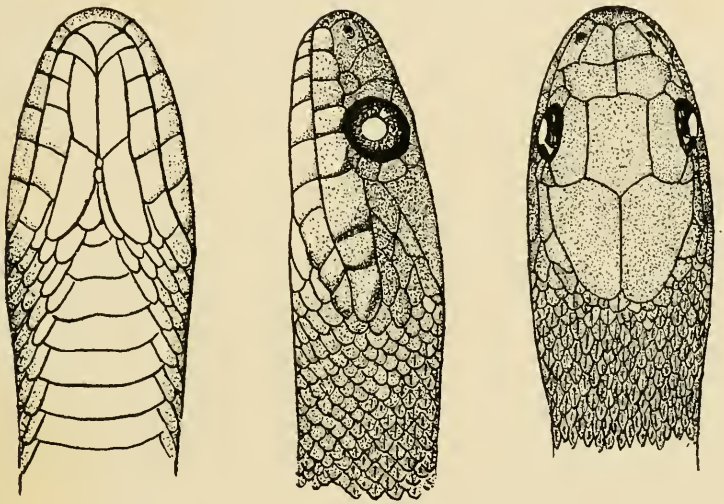

FIG. 3. *Natrix valida* Kennicott. EHT-HMS, No. 19224; El Limoncito, near La Venta, Guerrero, Mexico.

equal in length, the posterior wider, curving on inner edges, separated by one scale anteriorly, three posteriorly; lower labials 9-9, four touch first chinshields; diameter of eye equal to its distance from nostril; 26 scales across back of head; scale formula, 21, 21, 19; ventrals, 133; subcaudals, 72; anal divided; six scales between the third ventral and the last lower labial.

Scales all keeled, save the anterior part of the first (outer) row of scales; rather dimly keeled posteriorly; no apical pits.

Color. Variable grayish olive-brown above and on sides; a row of small dark spots on the fourth scale row, the spots encroaching somewhat on adjoining row, each spot separated by width of about one scale; the next three outer scale rows lighter, but the upper edge of outer scale row with a fairly continuous dim brownish line; on median scale row a hair-fine whitish line present; on each side of

light line the adjoining two scale rows are darker than the other lateral rows; below white; chin cream; head brownish; upper labials light with dark marks along sutures; lower labials whitish with dim gray-brown lines on sutures. Total length, 181 mm.; tail, 45 mm.

While this very young specimen may represent a separable form, it seems unwise to recognize it until other specimens are available. Colima is the nearest point where the species has been recorded.

Ninia sebae sebae (Duméril and Bibron)

Streptophoris sebae Duméril and Bibron, Erp. Gén., 7, 1854, pp. 515-517.

In the collection are EHT-HMS Nos. 5210-5215, 15949-15960 obtained at Cuautlapa, near Orizaba, Veracruz, Taylor collector; Nos. 5216, 15961-15966, Potrero Viejo, Veracruz, Dyfrig Mc. H. Forbes, collector; No. 5217, locality uncertain, but thought to be from near base of Mt. Popocatepetl, Puebla, John Rickards, collector; No. 15967 near Fortín, Veracruz, Taylor collector.

Eight of the specimens show an equal distribution of the black pigment spots over the apices of dorsal scales; eighteen specimens have a double series of small black spots on the back, usually more or less regularly distributed; there are from 17 to 25 pairs which may tend to alternate in some places. One of the specimens has the spots sparse and in a single, irregular, median row (No. 15949). One specimen has the spots arranged in narrow continuous (or broken occasionally) bands across body. These reach first scale row; about 26 on body, 11 on tail (No. 5217).

The type locality "Mexico" has been recently restricted by Karl P. Schmidt, to Veracruz. The variation in the ventrals is given by Duméril and Bibron, 131-138 ventrals; 44-56 subcaudals. Since these counts fit into similar series made from specimens from a single locality (with one exception), there can be no significance in the differences in the range (the exception being 131, which is lower than my lowest count of 135, a male from Cuautlapa).

The scale data taken from the above series is as follows. Males (18), 135-145 ventrals, average 141; 52-59 subcaudals, average 55. Females (11) 139-148 ventrals, average about 142; subcaudals 44-52, an average of 48. Thus in these short snakes there is a broad overlap in the ventral counts in the two sexes; in the subcaudals there appears to be a sexual differentiation; the highest subcaudal count of a female specimen is equal to the lowest count for a male. There is, however, an average difference between the sexes of one scale in the ventral series and a difference of seven in the subcaudals.

Schmidt (Zoöl. Ser. Field Mus. Nat. Hist., XX, No. 18, October 31, 1936, Notes on Snakes from Yucatan) separates the Yucatecan form as *Ninia sebae morleyi*. The ventral average of the males is about 143, with a range from 141-147; an average of two higher than males of the typical form; the subcaudal average is 49, with a range from 44-54. This is an average difference of seven scales from the typical form. The ventral average for female specimens is about 147, a range from 145-152. This is five scales higher than females of *N. sebae sebae;* the subcaudals average about 43, with a range of 36-46. This average is five scales lower than the specimens in my series.

The scale formula is 23-19 about back of head; on body, 19-19-19. The neck count on one specimen was 17, on another 21. All others 19; the preanal count occasionally became 18, due to the dropping of the middle row (4 cases).

In only one case were there but six upper labials, this due to obvious fusing of the sixth and seventh. In one case only were there but six infralabials, due to an obvious fusion of the fifth and sixth. Five specimens had single preoculars, usually resulting from the segmentation of the upper part of third labial, and in some cases excluding the third labial from eye. Three others had preoculars on one side only, and one had two preoculars on one side and one on the other. They were wanting in all other specimens. Only one specimen had three postoculars. In all other specimens two were present. In all cases four lower labials touched the anterior chinshields which in two cases were no longer than the posterior pair.

Seven of the specimens were above 300 mm. in length. The largest is No. 5217, and measures 321 mm.; No. 15966 measures 320 mm.

Males have asperities on the mental, first pair of labials, and first pair of chinshields. These are not or barely indicated in females.

Ninia diademata Baird and Girard

Four specimens were captured at Cuautlapa (Tlilapan) near Orizaba, Veracruz, in 1938 (EHT-HMS Nos. 5581-5584). These have the following scale counts, respectively: ♀ 148-83 = 231, ♂ 145-90 = 235, ♀ 148-85 = 233, ♂ 143-96 = 139. The scale formulae are normally 21-19-19-19. In one, the scales number 24 about the head, and one has a count of 17 in front of anus. In the largest male, No. 5584, the mental, first pair of lower labials, and the first pair of chinshields have rather prominent asperities; these are less distinct in the smaller male. All scales are strongly keeled and

longitudinally striated, the striations extending onto the outer edges of the ventrals.

Geophis semidoliatus (Duméril and Bibron)

Geophis semidoliatus Taylor and Smith, Univ. Kansas Sci. Bull., XXV, 1938 (1939), pp 244-245.

A large series of this species (EHT-HMS Nos. 16010-16140) was obtained near Cauautlapa (Tlilapam, Qualquapan) in 1938. Scale counts were made on 96 specimens—49 males and 47 females—and the results are as follows: The ventrals on females vary between 155 and 170 (16 scales), while in the males they vary between 137 and 143 (7 scales). The subcaudal scale counts vary, in females, from 20 to 27 (8 scales), and in males from 22 to 30 (9 scales). The range of the total count (ventral and subcaudals) in females is from 176 to 195 (20 scales); only a single specimen exceeded 188; in males the variation is between 160 and 173 (14 scales).

Thus the known maximum for ventrals of 195, and the known minimum of 160 was reached in a series taken in the same identical locality.

In this series the supraoculars, preocular, postocular, temporal, and anal are invariable. The scale formula 15-15-15 is very stable. One specimen has 14 scale rows on neck, and one had 14 in front of anus; one specimen had the formula 13-15-15-13. A pair of fused labials accounted for the count of five labials on one side in two specimens, instead of six.

I suspect that the species has a limited distribution. It is known only from central Veracruz.

Geophis blanchardi Taylor and Smith

Geophis blanchardi Taylor and Smith, Univ. Kansas Sci. Bull., XXV, June 1, 1838 (1939), pp. 245-247, fig. 2 (type description; type locality, two miles southwest Acultzingo, Veracruz).

Data taken on five topotypic paratypes of *Geophis blanchardi* (EHT-MHS Nos. 5479-5483) were omitted from the type description. I take this occasion to comment on these specimens.

The dark marking shown on the head of the type is not due, as suggested, *loc. cit.*, to shed scales. The frontal and parietal scales are normally darker than the remainder of the dorsal head scales. In all the specimens, save type, the outer edge of the parietal is not as dark as the remainder of the scale. Two of the specimens are grayish-blue above, more or less iridescent; the other three are darker, more or less bluish-black to blackish, and likewise iridescent. In all the specimens the ventral markings are as depicted for the type. The lower labials are as heavily pigmented as the upper

labials save that in two of the specimens there is an ill-defined light spot on the labial border below the eye as in the type.

The following ventral and subcaudal scale counts obtain. The ventrals are counted to the last chinshields.

No. 5479, ♀, 161-30 = 191; No. 5480, ♂, 155-39 = 195; No. 5481, ♂, 156-40 = 196; No. 5482, ♀, 162-31 = 191; No. 5483, ♀, 163-31 = 194. In No. 5479 the 4th to 11th subcaudals are single; in all, the anal is single, and the head scales are as in type unless otherwise mentioned; in all, the scale formula is 17-17-17.

Enulius unicolor (Fischer)

Enulius unicolor Taylor and Smith, Univ. Kansas Sci. Bull., XXV, 1938 (1939), p. 247.

Eight specimens of this species were taken by me in 1938 as follows: EHT-HMS No. 5572, Agua del Obispo, Guerrero, July 6. Nos. 5573-5578 near Huajintlán, Morelos (km. 133) July and August; No. 5579 between Zitácuaro and the Rio Tuxpan, Michoacán. This latter specimen extends the range very considerably to the northwest. Despite the wide range, the characters are relatively constant.

There is no trace of a light collar in any of these specimens; the frontal is longer than its distance from the end of the snout. There is some variation in the lower labials, there being three or four labials touching the large anterior chinshields. Younger specimens are olive above, while the older specimens are light brown on all except outer scale row, which is creamy white. The ventral coloration is creamy white.

Scale data for Enulius unicolor (Fischer)

No.	Sex	Ventral	Subcaudal	Total
5572	♀	190	107	297
5574	♀	192	...	...
5575	♀	193	93	286
5579	♀	196	96	292
5573	♂	178	...	...
5576	♂	174	107	281
5577	♂	177	103	280
5578	♂	175	104	279

Adelphicos quadrivirgatus Jan

Rhabdosoma lineatum Günther (*part.*), Cat. Col. Snakes British Mus., 1858, p. 11.

Adelphicos quadrivirgatus Jan, Arch. Zoöl. Anat. Fisio., II, 1862, p. 19 (type description; type locality "Java" *in errore*); Müller, Verh, Nat. Ges. Basel, VI, 1878, p. 573, 592, 654, Costa Grande, Guatemala (shows that the type locality is not Java); Bocourt, Etude sur les Reptiles, Miss. Sci. Mexique et dans l' Amér. Cent; Livr. 9, 1883, Pl. XXXII, figs. 11, 12 (Alta Vera Paz, Guatemala); Günther, Biologia Centrali-Americana, Reptilia and Batrachia, p. 94, 1893. (Alta Vera Paz, Guatemala, Jicaltepec, Veracruz; Belize, British Honduras); Dunn, Amer. Mus. Nov., No. 314, May 16, 1829, p. 1, and Copeia, No. 4, 1931, p. 163

(Genus); and Proc. Acad. Nat. Sci. Philadelphia, LXXXIV, 1932, p. 32 (Carmelina, Honduras); Stuart, Univ. Michigan Mus. Zoöl. Misc. Publ. No. 29, October 1, 1935, p. 51 (La Libertad, Guatemala).

?Rhegnops visoninus Cope, Proc. Acad. Nat. Sci. Philadelphia, 1866, p. 128 (type description; type locality, British Honduras).

?Rhegnops Sargii Fisher, Jahrb. Hamburg Wiss. Anst., II, 1885, pp. 92, 93 (type description; type locality, Guatemala).

?Adelphicus visoninus Cope, Bull. U. S. Nat. Mus., No. 32, 1887, p. 85.

?Adelphicus sargii, Cope, Bull. U. S. Nat. Mus., No. 32, 1887, p. 85.

Adelphicus quadrivirgatus Cope, Bull. U. S. Nat. Mus., No. 32, 1887, p. 86.

Atractus quadrivirgatus Boulenger, Cat. Snakes British Mus., 2d ed., II, 1894, pp. 312, 313 (Mexico, Honduras, Guatemala); Amaral, Mem. Inst. Butantan, IV, 1929, p. 189 (Central America and Mexico); Werner, Zoöl. Jarb., Bd. 57, 1929, pp. 158, 161.

A series of specimens (EHT-HMS Nos. 15331-15342) were obtained from San Cristobal, Chiapas, collected by Henry Thomas. I collected a single specimen (EHT-HMS No. 4561) near Ocozucoautla, Chiapas, September 3, 1935, from under a rock near a small waterfall. The first group of specimens show the following ventral, subcaudal and total scale counts (the ventrals are counted to the second pair of chinshields; these anterior scales are not widened, but are single, median scales; there are usually two or three between the first widened ventral and the small second chinshields): ♀ 138-23 = 161; ♂ 128-36=164; ♂ 126-31=157; ♀ 136-27=163; ♀ 130-24= 154; ♂ 127-34=161; ♀ 132-25=157; ♂ 128-37=165; ♀ 138-25= 163; ♂ 128-32=160; ♀ 135-24=159; ♂ 123-33=156.

The general coloration above is dark or light brown with some indication of a darker medial line or sometimes with narrow lines on the sixth scale rows. In others there is little variation evident in the dorsal coloration. The lateral stripe, occupying most of the space on the third row and adjacent parts of the second and fourth rows, is, in some specimens, of a nearly uniform color. In others, the scales show lighter centers. The outer scale row may be almost entirely cream; or with the edges of each scale nearly surrounded by black; or the dark color may form a series of small spots on the outer row. Some have a row of tiny dots on the outer edge of each ventral.

Two of the specimens have large, deep black, triangular spots medially on the ventrals beginning at about the first widened ventral and continuing to vent and forming a continuous line. A dark median line is present under the tails of all the specimens; three other specimens have these median ventral dark spots faintly indicated; in the others the entire ventral surface of body is cream; head entirely dark above, the chin and upper and lower labials, creamy-yellow. In some specimens one upper labial (or more) may have its upper edge dark. In life the specimens are strongly iridescent.

In the character of the head scales there is slight variation. The

upper and lower labials are 7-7; the scale formula, 17-15-15-15; two postoculars; one loreal; no preocular; third and fourth labials entering eye. One specimen only has the loreal segmented leaving a small preocular; one specimen has the second labial segmented making eight supralabials on one side. Another has eight lower labials on both sides.

One specimen, No. 4561, has the chinshields bordering the lip, there being two labials anterior, and four labials posterior to the chinshield; on one side the two temporals are fused making a single long temporal.

The resemblance of the generic characteristics of the genus *Adelphicos* is strikingly similar to those of *Oxyrhabdium* from the Philippines.

Diadophis regalis dougesii (Villada)

Diadophis regalis dougesii Taylor and Smith, Univ. Kansas Sci. Bull., XXV, 1938 (1939), pp. 240-241, fig. 1.

Two specimens, EHT-HMS Nos. 5555 and 15869, the first from near Tulancingo, Hidalgo, the second from 15 kilometers west of Morelia, Michoacán. The ventral and subcaudal counts are respectively, ♂ 185-61=246, ♂ 193-61=254; upper labials, 8-8, 7-8; lower labials, 8-9, 9-8; scale formula, 23-17-17-15, 22-17-17-15; width of nuchal yellow band, 2½ scales, 2 scales. The specimen from Michoacán is the darker, now almost black (having been preserved in formalin); the specimen from Hidalgo is olive-gray-brown generally.

Conopsis frontalis (Cope)

Conopsis frontalis Taylor and Smith, Univ. Kansas Sci. Bull, 1938 (1939) p. 241, pl. XXIII, fig. 3.

I collected two specimens of this species in 1938 (EHT-HMS Nos. 5497-5498) near Huajintlán, Morelos (km. 133). These two differ from each other in the general color pattern. No. 5498 has a series of 40 dark, median, dorsal spots from neck to anus (tail broken), separated by a cream spot a little longer than a single scale, and about two scales wide. The dark spots are three to four scales long and four or five scales wide. On each side of these spots, after an interval of about one scale, is a row of somewhat elongated small spots which form a broken line on the third and fourth scale rows; this connects with the darker edges of the adjoining scale rows. The whole pattern suggests that the typical saddlelike blotches shown in the figure (Taylor and Smith *loc. cit.*) were broken laterally throughout the length of body and tail.

The general ground color is smoky lavender. A more or less regular series of dark flecks on the alternate scales of the outer row, may extend onto the ventrals. Ventral coloration is somewhat pinkish white. The head markings are very similar to those of the figure.

No. 5497 differs markedly. The dorsal spots are not well differentiated, but careful observation shows a transverse blotch outlined by the darker edges on scales, the outlines separated by a tiny white spot, medially. The scales all have light centers with dark edges, or one-half of the scales may be dark. The ventral coloration is ivory-white with the dark spots on the outer scale row encroaching on the ventrals.

Both specimens are males, the ventral-subcaudal count is: No. 5497, 155-44; in 5498, 157-25. Scale formula in both: 24, 17, 17, 17. The specimens agree with Michoacán specimens in practically all other character. No. 5497 has a large loreal segmented from the side of the prefrontal on one side.

*Dryadophis boddaerti mexicanus** Stuart

(Figure 4)

Eudryas boddaerti mexicanus Stuart, Occ. Papers Mus. Zoöl. Univ. Michigan, No. 254, February 9, 1933, pp. 8-9. (Type description; type locality "Zacuapan," Mexico).

Three specimens of this rare snake are in the collection from Potrero Viejo, Veracruz: EHT-HMS. Nos. 5256A, 5598, collected by E. H. Taylor; No. 5599 by Dyfrig McH. Forbes. As the form has previously been known only from type I include a description and figure.

Description of No. 5598. Rostral, visible above for a distance less than half the internasal suture, broader than high; internasals longer than broad, rounded anteriorly, the suture between them about four-fifths of suture between the prefrontals; latter much broader than long; frontal narrow, elongate, its widest part equal or only minutely larger than width of supraoculars; one-fifth to one-sixth longer than its distance from end of snout; parietals a little longer than frontal, shorter than their distance from the internasals; nasal divided, the anterior part largest, including greater part of nostril; loreal longer than high; one preocular; two postoculars; diameter of eye equals distance to anterior edge of nostril; temporals, 2 + 2; upper labials, 9-9, the fourth, fifth and sixth entering the eye; 10-10 lower labials, the first five touch the first chin-

* The nomenclature of this group of snakes is undergoing revision at the hands of Dr. L. C. Stuart.

shields which are shorter than second pair; latter in contact for half of their length; five rows of scales between first widened ventral and the last lower labial; scale formula, 25-19-17-17-15-15; all scales smooth. Ventrals, 184; anal divided; subcaudals, 110; total length, 1095 mm.; tail, 338 mm.; tail length in total length, 3.27; length of head, 29 mm., head width, 13 mm.

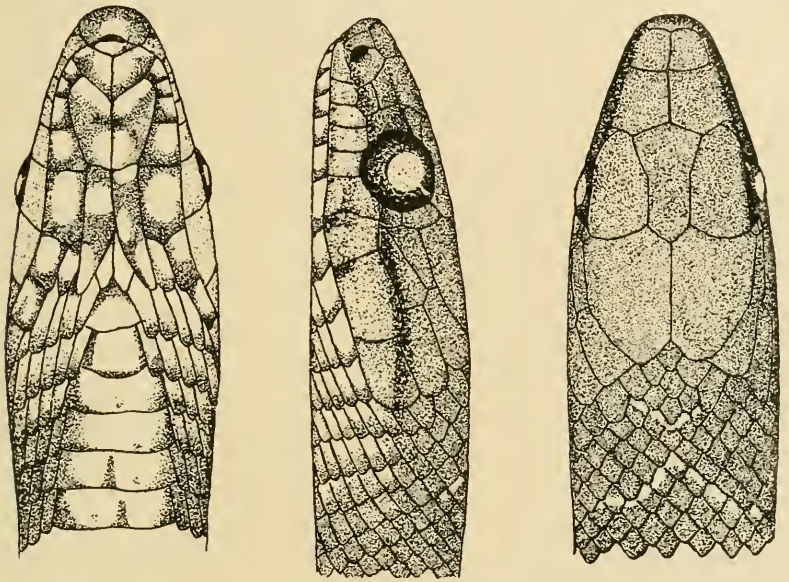

FIG. 4. *Dryadophis boddaerti merxicanus* Stuart. EHT-HMS, No. 5598; Potrero Viejo, Veracruz, Mexico. ×2.

Color in life. Above, nearly uniform light olive, generally yellowish below; labials yellowish-cream with a dark brown to blackish line from eye along their upper borders; a few black flecks on lower edge of upper labials. Chin and lower labials grayish with enclosed cream spots on all the scales; a series of dim cream transverse bands, the first forming a median angle, visible for about one-third the length of the body.

Since preservation, the color has become dark olive-brown above, the lighter color of the ventral surface has become clouded; the upper labials have become much darkened.

Variation. No. 5999 has been preserved in formalin and the color has become dark brownish (blue where the epidermis has shed). The markings under the chin are scarcely discernible and the venter is clouded ultramarine. A young specimen, No. 5256, is very light

brown above, the transverse cream lines visible for more than half the length of the body, but they are distinct only anteriorly; chin and lower labials dark gray, enclosing cream spots. Where epidermis is shed the color is ultramarine-gray. The scale count of the two above specimens are respectively: Ventrals, 177, 174; subcaudals, 109, 128. The scale formula of both is 24-19-17-17-15-15. No. 5599 is 1163 mm. in length; the tail, 345 mm.

Dryadophis sleveni Stuart

Eudryas sleveni Stuart, Occ. Papers Mus. Zoöl. Univ. Michigan No. 254, February 9, 1933, pp. 9-10. (Type description; type locality, Maria Madre Island, Tres Marias Islands. Mexico.)

A specimen captured four miles north of Acapulco, Guerrero, is tentatively referred to this species. The head squamation appears to be rather close to *sleveni;* the ventral count is only two more, the subcaudal count only four more, than recorded for *sleveni.*

The specimen is a juvenile with an elaborate pattern which has not been recorded for *sleveni.* However, it may occur in the young.

The specimen is generally brownish-olive with a series of narrow, transverse, brownish-white bars which cross the back, connecting with dim light lines running the length of body on the fourth and fifth scale rows (posteriorly on fourth). This leaves a series of 71 quadrangular spots on the back of body, slightly edged with black anteriorly and posteriorly; the pattern is continued on the tail. The coloration below the lateral light line is variegated darker and lighter, but appearing rather uniform on the whole, save for a suggestion of lighter lineation on first and second scale rows; below, the color is yellowish-white, while the chin and lower labials are mottled with cream spots surrounded by darker grayish markings; this coloration continues on the first ten ventrals; whitish on underside of tail with minute blackish flecks along the inner edges of the scales. Scale formula, 24-17-17-15-15. Ventrals, 195; subcaudals, 115.

Spilotes pullatus mexicanus (Laurenti)

Spilotes pullatus mexicanus Amaral, Mem. Inst. Butantan, IV, 1929, pp. 282-284, fig. 2, after Günther's *Spilotes salvini.*

A specimen in the collection (EHT-HMS No. 5496) was collected by Dyfrig McH. Forbes and presented to me.

It presents the following scale characters: Ventrals, 214; subcaudals, 123; anal single; upper labials, 7-8 (abnormal on both sides) third and fourth (fourth and fifth) entering eye; lower labials, 8-9; four touch the first chinshields, which are somewhat shorter than second pair; latter separated by a row of scales; scale

formula, 21, 17, 18, 19, 17, 14, 12; median dorsal row single anteriorly, double posteriorly.

The specimen is black above, with yellow diagonal marking on which the yellow scales usually have black spots on their borders. The yellow spots on the head are arranged more or less as transverse rows. The labials are yellow with black sutures. The ventrals are yellow, variously spotted black.

Elaphe mutabilis (Cope)

(Figure 5)

Coluber mutabilis Cope, Proc. Amer. Philos. Soc., XXII, 1885, p. 175, (type description; type locality, Vera Paz, Guatemala. Reported also from Costa Rica; Tehuántepec, and Guanajuato).

I am referring a specimen (EHT-HMS No. 5193) collected by Dr. Hobart M. Smith at El Sabino, Uruapan, Michoacán, to this form. It is a juvenile specimen and the markings are well defined.

The characteristics of the head scales are shown in the figure. They differ in certain points from the type description. The pre-

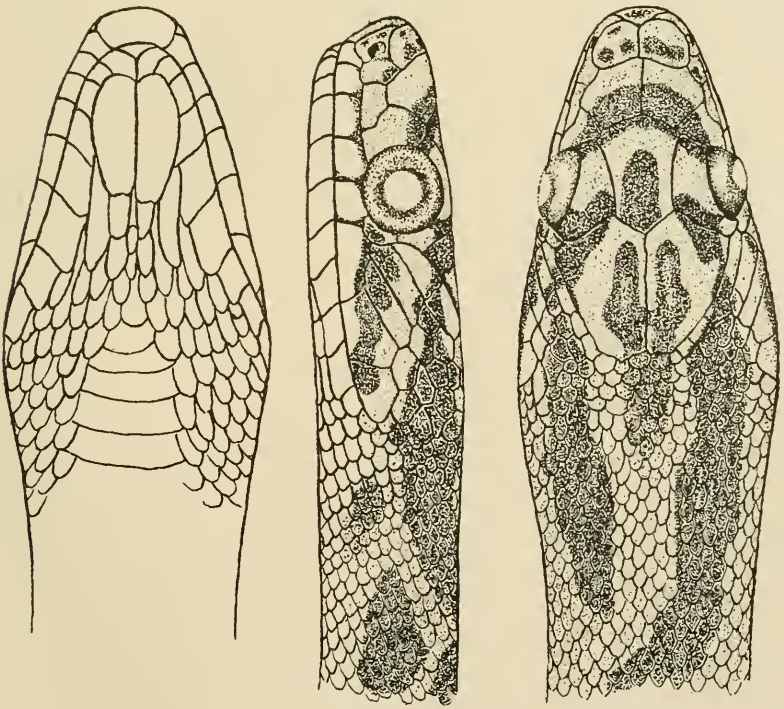

FIG. 5. *Elaphe mutabilis* (Cope). EHT-HMS, No. 5193; El Sabino, Uruapan, Michoacán. ×3.

ocular is in contact with the frontal; the prefrontals are a little wider than long; the frontal is slightly narrowed medially, longer than wide and its length greater than its distance from the end of the snout; the sixth labial is low, touching only two temporals.

The specimen presents the following data: Ventrals, 262; subcaudals, 115; scale formula, 36, 31, 33, 26, 22; 57 spots on body; 35 on tail; 8-8 upper labials; 11-11 lower labials; preocular, 1-1; postoculars 2-2; temporals, 3 + 4 + 5; loreal elongate, nearly twice as long as high. Nasal constricted, the anterior moiety much higher than posterior; scales of head, including temporals, minutely rugose, save that the rugosities are present only on the sides of the frontal and the outer edges of the parietals.

The ground color is faun, each scale having a slightly darker center and two cream spots at its base. The body has 57 quadrangular dark-brown spots; the tail has 35, which are somewhat darker on the edges, each scale with a slightly lighter center. A lateral series of spots alternating with the dorsal blotches and still lower on side there is a series of smaller dots alternating with the lateral spots. On the edges of the ventrals and extending onto the first scale row is another series of tiny blotches which are separated from each other by cream spots; posteriorly the dark dots are almost continuous and the cream spots are more conspicuous. The median part of the ventral scales lack spots but the posterior edges of the scales are of a very slightly darker shade than the remainder. The head markings are depicted in the figure. Length total, 486 mm.; tail, 104 mm.

Elaphe lacta (Baird and Girard)

Elaphe lacta Dunkle and Smith, Occ. Papers Mus. Zoöl., Univ. Michigan, No. 363, Dec. 16, 1937, p. 6.

I collected a specimen of this form (EHT-HMS, No. 5372) about 30 km. south of Laredo in Nuevo León, in 1936. It agrees well with specimens in this collection (Nos. 4683-4684) collected and studied by Dunkle and Smith. Ventrals vary between 217-224 (the ventral count for No. 4683 is 217 instead of 205). In all, the alternating bands of dark and light loop across the head; the median scale series on the posterior part of the body are more or less keeled; and the ventrals are marked with numerous small quadrangular dark spots, which blend to form an uninterrupted row on the subcaudals.

A second specimen (No. 5552), taken 4 km. north of Villagrán Tamaulipas, a younger female specimen, has 234 ventrals—the tail lacking the distal part.

There are 41 spots on the body and 16 + on the tail. The quadrangular spots on the venter tend to segregate and make irregular dark bars on the venter, separated by two or three unspotted ventrals. Temporals, 3 + 3 + 5 on right side, irregular on left; upper labials, 8-8; lower labials, 13-13; scale formula, 36, 25, 27, 27, 22.

Elaphe chlorosoma (Günther)

Coluber chlorosoma Günther, Biologia Centrali-Americana, 1894, p. 115, pl. XLI (type description; type locality, "Atoyac, Guerrero, Amula, Guerrero, San Ramon, Jalisco, 1,500 feet").

Three specimens are in the collection (EHT-HMS, Nos. 5190-5192). The first two numbers are from El Sabino, Uruapan, Michoacán; No. 5192 is from near Chapala, Jalisco. They agree with the type description in most characters. The specimens are of a bluish-gray color. Each scale has a very tiny dark mark at the base with a tiny white spot on each side of the scale just in advance of the darker area. Light edges on ventrals form a more or less continuous, narrow, light line on the ventrolateral region. The outer parts of the ventrals are gray save for the light edge, while the major, medial part of each ventral is immaculate cream. Chin and labials cream, save that the upper edge of the anterior labials are gray and the last labial is entirely gray.

These specimens have the following characters, respectively: No. 5190 ♂, 5191 ♂, 5192 ♀; ventrals, 260, 262, 267; subcaudals, 118, 120, 93; upper labials, 8-8, 8-8, 9-9; lower labials, 9-9, 10-10, 10-10; preoculars, 1-1, 1-1, 1-1; postoculars, 2-2, 2-2, 2-2; the preocular is separated from the frontal in all. The temporals are somewhat irregular, but three is the normal number of anterior temporals.

The scale formula for the largest (female) specimen is 37, 32, 35, 39, 32, 25, 23; its total length is 1200 mm., the tail, 240.

Elaphe flavirufus (Cope)

(Figure 6)

Coluber flavirufus Cope, Proc. Acad. Nat. Sci. Philadelphia, 1866, p. 319 (type description, type locality, Yucatán).

This species has remained rather rare in collections. I obtained a single specimen (EHT-HMS, No. 5373) crawling across the highway at night at km. 615 north of Mexico on the Laredo-Mexico City highway about midway between El Limon and Llera.

Cope's type was a young specimen with a yellow ground color, unspotted below; above, with spots on back brick red, broadly brown margined. One foot 10 inches in length.

The present specimen is adult, the general ground color faun, with 34 large, brownish, black-edged, dorsal blotches partly broken and occasionally confluent; alternating with these are 35 smaller lateral blotches, of similar color, each longer than high, reaching first scale row or ventral edge. On edges of the ventrals a series of small spots sometimes opposite sometimes alternating with the lateral spots. The character of the head markings is shown in the figure given.

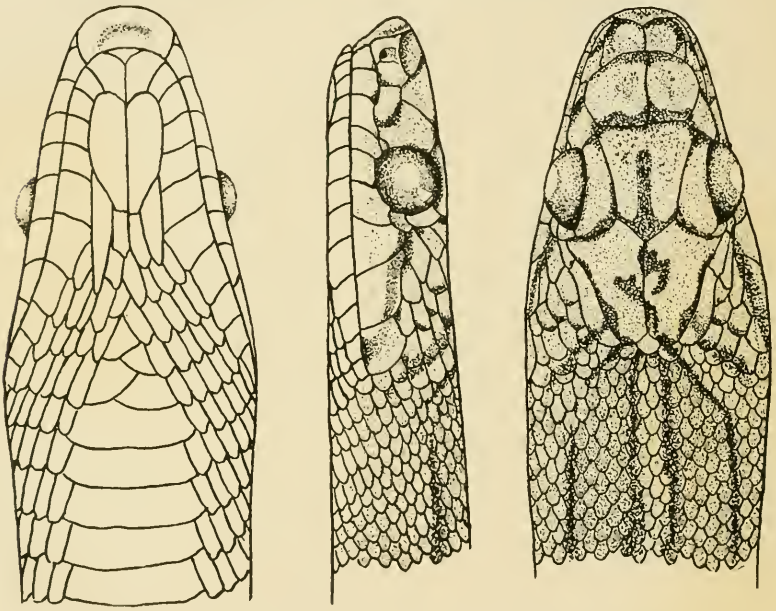

FIG. 6. *Elaphe flavirufus* (Cope). EHT-HMS, No. 5373; between El Limon and Llera, Tamaulipas, Mexico.

The specimen is a female; ventrals, 253; subcaudals, 107; scale formula, 35, 27, 29, 31, 26, 21; upper labials, 9-9, the 4th, 5th, and 6th entering orbit; 13-13 lower labials; large preocular forming a suture with the frontal (on one side a tiny scale is partially segmented, this forming a second preocular); two postoculars, the upper largest; temporals 3 + 4, the lower anterior pushed back from the postoculars; the second upper is elongate, reaching to posterior end of the parietals; outer anterior part of parietals partly segmented. Ventrals rather angulate, the outer pigmented ends are lateral; ventrals below immaculate yellowish.

The measurements are: total length, 1,120; tail, 238.

This record is far to the north of the known range of the species. It is known in Mexico from Central Veracruz, Yucatán, Chiapas and Tabasco.

Salvadora mexicana (Duméril and Bibron)

Salvadora mexicana Smith, Univ. Kan. Sci. Bull., XXV, No. 12, June 1, 1938 (1939), pp. 231-232, pl. XXII.

Salvadora mexicana Bogert, Pub. Univ. California at Los Angeles in Biol. Sci., I, No. 10, pp. 184-186.

I obtained four specimens of this species in Guerrero and Southern Morelos in 1938, as follows: EHT-HMS Nos. 5587 near El Limoncito, 15 km. N. Acapulco, June 26; 5588, near Totolapam, Guerrero, June 6; 5589, 5590 Huajintlán, Morelos (km. 133), July 7.

No. 5587 had partially swallowed a large *Sceloporis melanorhinus,* and No. 5588 had eaten a *Cnemidophorus sp.* which it was made to disgorge. All the specimens are adult. The ventral-subcaudal count (in the order given above) is as follows: 189-125, ♂ ; 187-136, ♀ ; 190-132, ♂ ; 187-137, ♂ .

These counts, together with those given by Smith (*loc. cit.*), show a slightly higher average of caudal scales for specimens from Guerrero and Morelos as compared with those from Colima and Michoacán (134-127.5). There is a difference of only one scale in the average of ventrals.

The total ventral-subcaudal counts show the following small differences: The average for Michoacán and Colima specimens is 215.6; the average for Guerrero and Morelos specimens 220.9. The males and females cannot be separated on the basis of the counts alone, males sometimes exceeding the female ventral count, and females equaling the male subcaudal count.

Pituophis deppei deppei (Duméril and Bibron)

Pituophis deppei deppei Stull, Occ. Papers of the Museum of Zoölogy, Univ. Michigan, No. 250, October 12, 1932, pp. 1-2.

A series of specimens of this common form are in the collection: EHT-HMS No. 5374, thirty miles west La Rosa, Coahuila; 5373, 15 miles south Ixmiquilpan, Hidalgo; 5376, near Alseseca, Puebla; 5377, km. 226, 22 km. north of Tehuacán, Puebla; 5378, 5383, San Juan, Teotihuacán, Mexico. 5379, eleven miles east of Aguascalientes, Aguascalientes; 5558, near Sabinas Hidalgo, Nuevo León.

Pituophis lineaticollis (Cope)

Arizona lineaticollis Cope, Proc. Acad. Nat. Sci. Philadelphia, 1861, p. 600 (type description; type locality, "Mexico").

Three specimens of this rare species are in the collection (EHT-HMS Nos. 5206, 5407, 15360). All were collected near Tres

Cumbres (Tres Marias) near the summit of the range between Mexico City and Cuernavaca at an elevation between 9,000-10,000 feet. The first two specimens, both young, have been crushed by automobiles. The third specimen presents the following characters:

Rostral narrowly visible above; nasal divided; loreal longer than high; one preocular; two postoculars; upper labials, 9-9, the fourth, fifth and sixth border orbit (on left side the fourth only and a large subocular, the latter apparently segmented from the fifth or sixth labial); 12-12 lower labials, 4-5 touching the first pair of chinshields which are larger than second pair; latter widely separated by two or three scale rows (on the left side one is broken in two); only one pair of prefrontals. Scale formula, 35, 27, 27, 25, 21; ventrals, 238; subcaudals, 65; anal single.

Head light brown above, yellow below; two longitudinal black lines separated by 3½ scale rows, begin on neck and continue back about one-fifth the length of body; here they break up into paired, elongated spots which become larger farther back, and unite to form still larger black spots with brown centers; toward the posterior part of the body, the spots are smaller, blacker and the centers of only a few scales of the spots have brown centers; twelve spots on tail. Anteriorly the venter is immaculate yellow-cream with brownish marks on the ends of ventrals; farther back blackish spots appear near the middle of the ventrals growing more numerous under tail.

Lampropeltis ruthveni Blanchard

Lampropeltis ruthveni Blanchard, Occ. Papers, Univ. Michigan, No. 81, p. 8, pl. 1, fig. 2 (type description; type locality, Pátzcuaro, Michoacán, Mexico) and Bull. 114, U. S. Nat. Mus., 1921, p. 221, fig. 74.

I obtained an adult specimen of this rare snake (apparently known heretofore only from type) about 15 km. east of Morelia, Michoacán, in 1938 (EHT-HMS No. 5511).

The specimen agrees with the type in most details of color and markings. The head is black as far back as the posterior fifth of the parietals where the color forms a very broad angle; lower edges of the lip with occasional yellow flecks; the prefrontal and internasals with lighter flecks; chin yellow save on anterior labial sutures; the first black band begins one and one-half scale rows back of the parietals; there are 25 grayish-white rings encircling the body, becoming somewhat widened ventrally and yellowish-white in color. These rings are bordered by black rings which narrow, as they cross the ventrals, to the width of one ventral; the red bands separating the triads are narrowed on the dorsal surface

and rarely (two bands in front of anus) have the red bands almost completely obscured. On the tail there are five triads, separated by red bands which are equal in width to the black and gray triad.

Ventrals, 190; anal single; subcaudals, 50; scale formula 27-21-23-23-19-17; nasal divided; upper labial, 7-7, the third and fourth entering orbit; lower labials, 9-9, four touching the anterior chinshields; posterior chinshields somewhat smaller than anterior, separated from each other by small scales; separated from the first ventral by about four scales; frontal rather long, longer than its distance from the end of the snout (7.4 mm. × 5.7 mm.); two postoculars; one preocular nearly as wide as high (loreal on one side elongated and entering eye). Rostral visible above for a distance equal internasal suture; temporals, 1 + 3, 2 + 3.

Total length, 932 mm.; tail, 137 mm.; length of head, 30.5 mm.; width of head, 19 mm.

EHT-HMS No. 5438, an incomplete skin, obviously of this species, was collected by Dr. Hobart M. Smith at El Sabino, Uruapan, Michoacán.

Lampropeltis triagulum nelsoni Blanchard

Lampropeltis triangulum nelsoni Blanchard, Occ. Papers Mus. Zoöl., Univ. Michigan, No. 81, p. 6, fig. 1 (type description; type locality, Acámbaro, Guanajuato, Mexico); and Bull. U. S. Nat. Mus.; No. 114, 1921, pp. 155-158, fig. 65.

EHT-HMS No. 5253, obtained by Dr. Hobart M. Smith at El Sabino, Uruapan, Michoacán, has a color pattern very similar to that depicted by the figure given by Blanchard *loc. cit.* It presents the following scale characters: Ventrals, 224, subcaudals, 54; scale formula, 28, 21, 21, 19, 19; one preocular, two postoculars; nasal apparently divided; temporals, 2 + 3; 7-7 upper labials; lower labials, 9-9; snout with a whitish band followed by a blackish band; labials with yellow-cream spots; anterior labials flecked with black, also some black spots on anterior chinshields. The bands encircle the body; the white (yellowish) bands narrow somewhat on the sides then widen on belly; red bands are not interrupted below and lack small black spots. There is a total of 18 triads on body; the tail banded with black and white bands, seven of each, the black twice as wide as the white. In this form the posterior chinshields are equally as long as the anterior.

A second specimen belongs to the variety of *nelsoni* which Blanchard believes suggests intergradation with *annulatus*. In this specimen (EHT-HMS, 15868, 15 km. west of Morelia, Michoacán) the red bands are encroached upon both dorsally and ventrally until the

red appears as spots on the sides (sometimes the red spots barely touching medially).

Ventrals, 107; tail with tip missing; 18 triads on body; one on head; proximal bands on tail show no red; anterior and posterior chinshields equal; 7-7 upper labials; 9-9 lower labials; 1 pre- and two postoculars; loreal large; nasal not divided; temporals irregular, 1 + 3, 2 + 3; preoculars, very large, nearly as long as high.

Lampropeltis triangulum annulata (Kennicott)

Lampropeltis annulata Kennicott, Proc. Acad. Nat. Sci., Philadelphia, 1860, p. 329 (type description; type locality, Matamoras (Tamaulipas, Mexico).

A typical specimen of this species was taken at Mamulique Pass, Nuevo León, in June, 1936 (EHT-HMS No. 5254). Ventrals, 197; caudals, 51; anal single; scales, 28, 21, 21, 19, 19; nasal distinctly divided; upper labials, 8-7 (the first apparently abnormally divided on the right side); 10-10 lower labials; labials 4, 5 (3, 4) enter orbit; preocular narrow, nearly twice as high as long; 18 triads on body (one on head); six cream bands on tail; the triads are fused posteriorly, only the first two on tail being separated by red; ventrally the cream bands encircle body but the red bands are interrupted (save anterior one) on the ventral surface by large black areas which connect with the black bands. Snout and head black to near posterior part of the parietals; lower labials largely black; cream bands with some pigment laterally.

Lampropeltis polyzona polyzona Cope

Lampropeltis polyzona Cope, Proc. Acad. Nat. Sci. Phila., 1860, p. 258 (type description; type locality Quatupe, near Jalapa, Mexico); Blanchard, Bull. U. S. Nat. Mus. No. 114, 1921, pp. 139-148, fig. 64.

Two specimens (EHT-HMS Nos. 5252, 5510) were collected by Mr. Dyfrig McH. Forbes at Potrero Viejo and presented to me. The first is quite typical and has the neck band encroaching on the parietals and including seventh and part of the sixth labial; this is preceded by a very narrow semicircular band; remainder of head black above save for yellowish-cream spots tending to form a band behind nostrils. Twenty-four triads on body; eight on tail; however, the last two or three are coalesced, eliminating the red; red bands nearly as wide as the triads; all scales tipped with black; dorsally the cream bands between the black bands are about one scale wide; all bands encircle body, but rarely the cream band is interrupted by a black spot.

No. 5510. The head markings of this specimen are similar to the preceding. The light, narrow band across the snout is complete.

Twenty-three groups of bands (black-yellow-black) on the body, but only five on the tail, the last two, only, fused to eliminate the last red band.

Scale data on the two specimens follow: Ventrals, ♂ 222, ♀ 238; subcaudals, 62, 57, scale formulae, 25-21-21-19-17, 25-23-23-21-19; upper labials, 7-7, 7-7; lower labials, 9-9; 10-10; preoculars, 1-2, 1-1; postoculars, 2-2, 2-2; temporals 2-3; 2-3. The larger (♀) specimen measures, total length, 1,125 mm.; tail, 155 mm.

Lampropeltis polyzona blanchardi Stuart

(Plate XLIX)

Lampropeltis polyzona blanchardi Stuart, Occ. Papers Mus. Zoöl., Univ. Michigan, Nos. 309, March 26, 1935, pp. 1-6 (type description; type locality, Valladolid Trail near Chicken Itzá, Yucatán).

Two specimens of a *Lampropeltis* collected at El Limoncito, about 15 km. north of Acapulco are referred to this form tentatively. The specimens show no evidence of mixture with *Lampropeltis triangulum nelsoni.*

The specimens (EHT-HMS Nos. 5512, 5513) have the following scale characters respectively: Ventrals, 217, 219; anal single; subcaudals, 52, 41; scale formulae, 28-21-21-19-19, 28-21-21-19-19; upper labials, 7-7, 7-7; labials enter eye, 3 & 4-3 & 4, 3 & 4-3 & 4; lower labials, 9-9, 9-9; labials touch first chinshields, 4-4, 4-4; triads (2 black bands, one dirty cream) on head, 1-1; on body, 15, 15; on tail, 4, 4.

The nasal is definitely single without division above or below the nostril; the second pair of chinshields are one-half or less the length of the first pair; one-half of the chin and the head to the back part of the parietals, solid black. The plate shows the detail of markings. Black red and yellow bands encircle body. Some of the red ventrals have some darker pigment. The scales of the cream bands have brownish-black spots, as do all of the red dorsal scales.

Pseudoleptodeira latifasciata (Günther)

Pseudoleptodeira latifasciata Taylor, Univ. Kansas Sci. Bull., XXV, 1938 (1939), pp. 343-344, pl. XXXI, fig. 4 (made type of genus).

Another specimen of this rare species was obtained at Huajintlán, Southern Morelos (km. 133). It presents the following characteristics: Nine bands on body; four on tail; typical red spot on head; ventrals, 182; subcaudals, 78; anal divided; upper labials, 8-8; lower labials, 10-10; posterior chinshields a little the longer; five scales between first ventral and last lower labial; scale formula, 25, 21, 21, 17, 16; two postoculars, two preoculars; temporals, 1 + 2 + 3; posterior maxillary teeth without grooves.

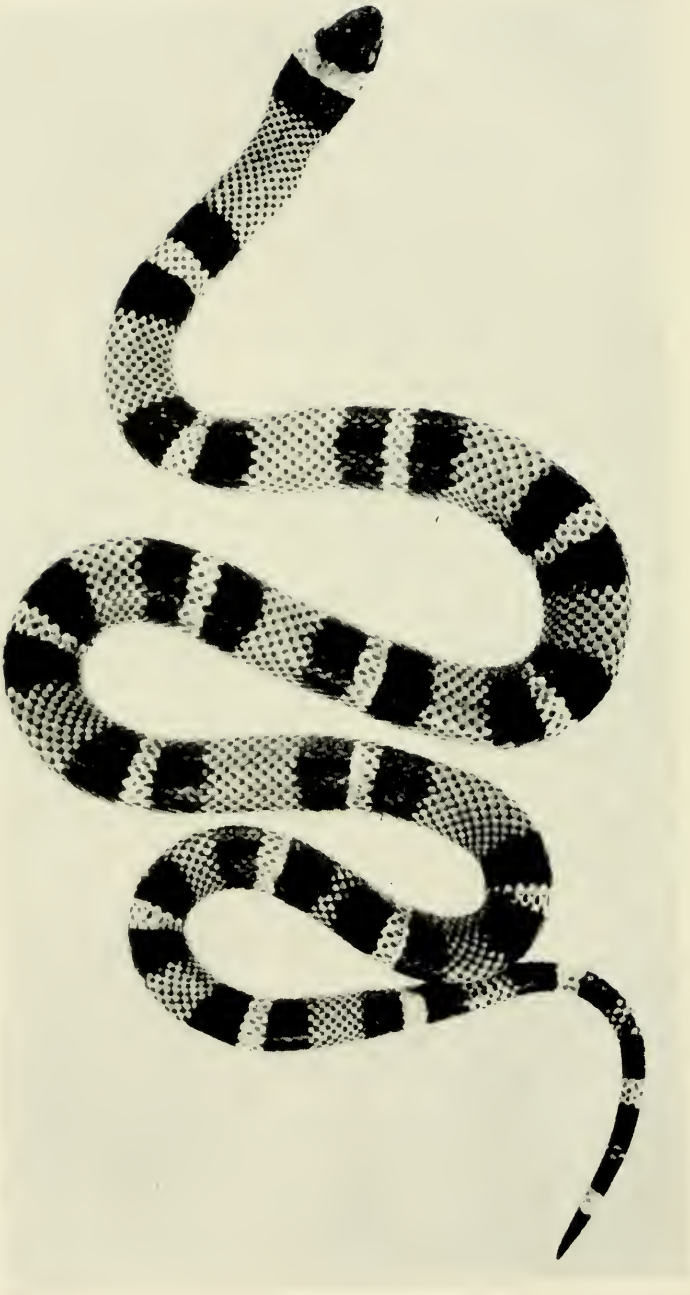

PLATE XLIX

Lampropeltis polyzona blanchardi Stuart. EHT-HMS. No. 5512; El Limoncito, near La Venta, Guerrero, Mexico. About natural size.

Hypsiglena torquata torquata (Günther)

Hypsiglena torquata torquata Taylor, Univ. Kan. Sci. Bull., XXV, 1938 (1939), pp. 371-373, pl. XXXVII, fig. 3.

Four specimens of this species were acquired from a single locality near Huajintlán, Morelos (km. 133). All agree with the figure (Taylor *loc. cit.*), save that two lack the dark bar bisecting the light nuchal ring; these two, however, have an elongate black spot on anterior edge of the nuchal ring; the first large nuchal dark band is notched anteriorly and is completely separated from the dark bands on sides of head.

Data from EHT-HMS Nos. 5561, 5562, 5563, 5564, respectively: sex, ♀, ♂, ♂, ♀; ventrals and subcaudals, 170-27,* 159-45, 161-45, 167-38; upper labials, 7-7, 8-8, 8-8, 7-8; lower labials, 9-9, 10-9, 10-9, 9-9; loreals, all, 1-1; lower labials touch chinshields, 4-4, 5-4, 5-4, 4-4; preoculars, all, 2-2; postoculars, all, 2-2; temporals, 2 + 2 + 3 (1 + 2 + 3), 1 + 2 + 3, 1 + 2 + 3 (1 + 2 + 4), 1 + 2 + 3; scale formula, 28-21-21-19-17, 25-21-21-19-17, 27-21-21-18-18, 29-21-21-19-19.

Chinshields are about equal, the second pair usually touching in front and separated behind.

The penis of No. 5563 is capitate, with a sulcus spermaticus which does not branch. Spines arranged in about six whorls, about middle part, all widely interrupted where the sulcus spermaticus, bounded on each side by smooth skin, passes anteriorly; terminal part with numerous, minute, fringed, pocketlike calyces.

Urotheca elapoides elapoides (Cope)

Pliocercus elapoides Cope, Proc. Acad. Nat. Sci. Philadelphia, 1860, p. 253 (type description; type locality, Jalapa, Mexico).

Elapochrus deppei Peters, Monatsb. Königl. Akad. Wiss. Berlin, June, 1860, p. 294, pl. — fig. 2 (type description; type locality "Mexico").

This brilliantly colored snake is represented in the collection by EHT-HMS Nos. 1580, 5087 Potrero Viejo, Veracruz, Dyfrig McH. Forbes, collector; Nos. 5255, 1776, Cuautlapa, Veracruz; No. 1421, Orizaba, E. H. Taylor, collector; Nos. 11642, 11643, Tres Brazos and Encarnación, Campeche, respectively, H. M. Smith, collector. The ventral and subcaudal counts (when tail is complete) for the specimens, in the order listed, is as follows: yg. 135-?; ♀ 136-100 = 236; yg. 133-105 = 238; ♂ 131-103 = 234; ♂ 128-?; ♀ 135-96 = 231.

In all specimens the scale formula is 21 (about head) 17-17-17; in all, the upper labials are 8-8, save one where seven labials are

* Tip missing.

present on one side; lower labials are 9-9 the last small, resembling a body scale; two preoculars, and two postoculars. The loreal is about as high as long, squarish or rectangular. In the order given the number of spots on the body and tail (when complete) of the specimens is: 10-8, 15-10, 11-8, 10-?, 14-?, 19-12. The females have the higher number of spots on body. However, the number of spots on the male from Campeche equal those of a female from central Veracruz.

Günther gives the date of publication of *E. deppei* as June 7, 1860; and for *elapoides*, June 26, 1860. I am unable to verify either of these dates. If they are correct the name *deppei*, given by Peters, must take precedence.

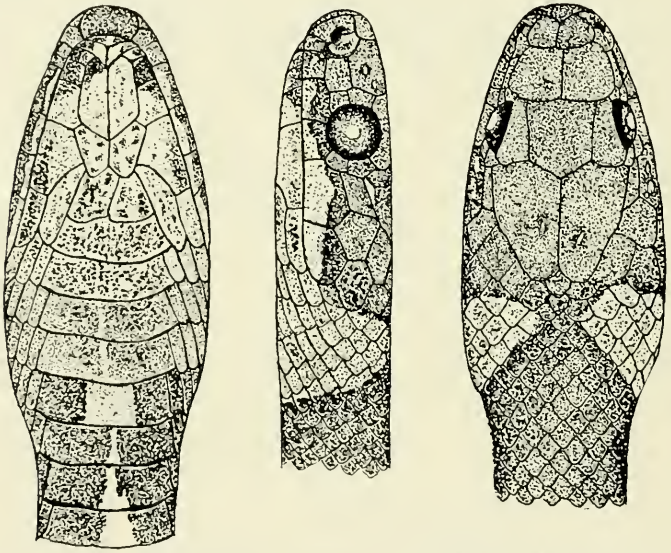

FIG. 7. *Tropidodipsas guerrerocnsis* sp. nov. EHT-HMS, No. 5518. Type. Near Buena Vista, Guerrero, Mexico. ×3.

Tropidodipsas guerrerocnsis sp. nov.

(Plate L; fig. 6)

Type. EHT-HMS No. 5518, collected near Buena Vista, Guerrero, June 26, 1938, by E. H. Taylor.

Diagnosis. Black with lighter dorsal bands, breaking up into flecks and indefinite spots behind. Scales in seventeen rows; upper labials, 6-6; anterior chinshields much longer than second pair; loreal elongate, rectangular, not entering eye; lower labials, 6-6; ventrals 198; subcaudals 65; all scales save two outer rows keeled.

Description of type. Adult female; body somewhat compressed; head elongate; part of rostral visible above, distinctly less than half the length of the internasal suture; internasals much wider than long; the scales distinctly oval on outer margins; prefrontals wider than long; frontal a little longer than the distance from the tip of the snout, somewhat shield-shaped; length of parietal reaches from parietal to middle of internasal; nasal scale constricted near its middle, but not or only partly segmented, the posterior part with a strong depression posterior to the nostril; loreal nearly rectangular, one and a half times as long as high, not entering eye; two preoculars; two postoculars; supraoculars much wider posteriorly than anteriorly; temporals 1 + 1 + 2, the last two large, extending more than half their length behind last labial; upper labials, 6-6, the first strongly notching the nasal, third and fourth entering orbit; having the following ascending order of size: 1, 2, 4, 3, 6, 5; anterior chinshields much longer than second pair; latter very short and broad, in contact, separated from first ventral by a pair of scales; one scale between first ventral and last lower labial; latter 6-6, four touching anterior chinshields; diameter of the eye equal to distance of eye to nostril; scales keeled save on the two outer rows; scale formula 19 (about head)-17-17-17; ventrals, 198; subcaudals, 65; anal single; total length, 508; tail, 103; length of head, 17; width of head, 8.

Color. Above deep purplish-black, anteriorly with narrow lighter bands which posteriorly become broken up into irregular flecks and spots; head black with a few minute whitish flecks. Chin, cream with a very heavy pigmentation, the color pushing up across back of jaw forming two rounded spots on sides of nape, separated medially; first broad, black band 11 scales long, medially, is very narrowly interrupted on ventral surface of neck; other dark bands reaching onto edge of ventrals; coloration of venter creamy-white, anteriorly, finely peppered with pigment, then with pigment intermingled with distinct small spots, increasing in number to tail; tail purplish below with some cream marking.

Remarks. This species appears to be most closely related to *T. fasciatus,* having seventeen scale rows, and an elongate loreal. It differs in a longer, narrower head, six upper and six lower labials, the two outer scale rows unkeeled, and apparently a higher ventral count: from the other recognized species, it differs as follows: from *philippi* Jan and *occidentala* Oliver it differs in having 17 instead of 15 scale rows, and a different coloration; from *sartorii* Cope and

PLATE L

Tropidodipsas guerrerocnsis sp. nov. EHT-HMS. No. 5518. Type. Near Buena Vista, Guerrero, Mexico. About natural size.

from *fischeri* Boulengeri the loreal is separated from the eye, the head longer, the details of color and markings different.

The specimen was found crossing a road early in the morning. It had been injured, presumably by a passing car.

Sibon nebulatus (Linné)

Coluber nebulatus Linné, Syst. Nat., I, 1758, p. 222 (No. 265).

Sibon sibon Amaral, Mem. Inst. Butantan, IV, 1929, p. 194; Schmidt Field Mus. Nat. Hist. Zoöl. Ser., XX, No. 18, October 31, 1936, p. 174.

On the assumption that *Coluber sibon* Linné (Syst. Nat., I, 1758, p. 222, No. 264) is a synonym of *Coluber nebulatus*, the name *sibon* has been chosen to replace *nebulatus*. I believe there is serious doubt that the two are synonyms and, that the name *sibon* should apply to an American snake. Linné regarded the species African, the name *sibon* being presumably a Hottentot name for an African species according to Seba (Vol. I, p. 22).

According to Daudin (Histoire Naturelle des Reptiles, Vol. VI, year XI, p. 435) "Linnaeus a décrit cette couleuvre d'après nature; il en a observé un individu garni en dessous de cent-quatre-vingt grandes plaques, et de quatre-vingt-cinq double plaques. Selon lui, la couleuvre sibon est d'un ferrugineux parsemé de blanc en dessus, et le dessous est blanc avec des taches brunes; de plus la couleur de la tête est blanche."

The type of *Coluber nebulatus* is extant (see Anderson Catalogue of Linnean Type-specimens of Snakes). Bihang till k. Svenska Vet.-Akad. Hand. Band 24, Afd. IV, 1899, p. 19.

A single specimen (EHT-HMS No. 5516) was collected near Palo Gordo (km. 386), Guerrero. The specimen is marked above with numerous, irregular, transverse black or brown markings which may extend entirely across the body or, more frequently, are broken into two or three parts. The edges of the spots are very irregular; between the spots the ground color is whitish, flecked or reticulated heavily with very tiny brown flecks. However, some of the scales may be pure white along the edges of the larger spots. The nuchal dark spot shows an inverted V-shaped series of white dots bordering it anteriorly; there is an occipital blackish spot with varied dark marking on the remainder of head; a dark line from eye to jaw angle; upper labials whitish some with more pigment than others; chin and lower surfaces white with a series of more or less alternating quadrangular black spots, on the sides of the venter and numerous small black flecks scattered between them; chin and throat, lightest; the under surface of tail darkest.

Loreal large, rectangular, entering eye; nasal apparently completely divided; prefrontal enters orbit equally with loreal; no preoculars; three postoculars; temporals, one + two; seven upper labials, the fourth and fifth enter orbit; eight lower labials; parietal a little longer than wide (5.3 mm. + 6.2 mm.) their length not reaching prefrontals; frontal length equal to distance of frontal from the tip of snout; rostral visible above as a very narrow line, not reaching as high as dorsal surface; diameter of eye as large as its distance from nostril; pupil vertical; 13 maxillary teeth increasing slightly in size posteriorly. 185 ventrals; 89 subcaudals; anal single. Scale formula, 19-15-15-15, the median dorsal row enlarged.

The hemipenis is provided proximally with numerous large hooks; while the distal two-thirds of the organ is caliculate. The tortuous sulcus spermaticus is forked for a short distance near distal end.

The species has been reported from Atoyac, Guerrero by Boulenger (Cat. Snakes Brit. Mus., 2d Ed. 1896, p. 644).

Trimorphodon tau Cope

(Plate LI; fig. 8)

Trimorphodon tau Cope, Proc. Amer. Philos. Soc., 9, 1869, p. 152; type locality, Isthmus of Tehuántepec, México. Taylor, Univ. Kan. Sci. Bull., XXV, No. 16, 1938 (1939), pp. 366-367.

Collecting in the neighborhood of the village of San Felipe, near the city of Oaxaca, I obtained a specimen of *Trimorphodon tau* Cope (EHT-HMS 5507) from under a small rock on an open pastured hillside, August 19, 1938; three days later a second specimen (EHT-HMS, No. 5506) was obtained on the hills west and somewhat north of the city of Oaxaca from under a rock on a similar open hillside. The two specimens are adults, one male and one female, and both differ in coloration from the very young type, as well as in certain details of squamation. These appear to be the only adult specimens known.

Description of Trimorphodon tau Cope (EHT-HMS 5506). Head rather small, somewhat differentiated from neck; body strongly compressed; rostral broader than high, bent back over snout, the portion visible above wider than internasals, almost double the length of the internasal suture; internasals distinctly broader than long (not "as broad as long"); prefrontals quadrangular, about as long as broad; anterior border of frontal transverse, the sides curving back to the posterior point (sides not with "straight lateral margins"), longer than its distance from tip of snout, only minutely shorter than parietals; latter relatively short, their length equal to their distance

from internasals; supraoculars strongly widened posteriorly; nasal completely divided, the nostril an elongate diagonal slit; the two scales together form a rectangle; anterior loreal much higher than nasal with a long entrant angle between prefrontals and internasals; second loreal lower than first, touching two labials on one side, one on the other (in No. 5507 this scale has a small part segmented above, and the upper part of the third labial is segmented, making two extra loreal scales; the type has three loreals); three preoculars; the upper largest and separated from the frontal; three postoculars;

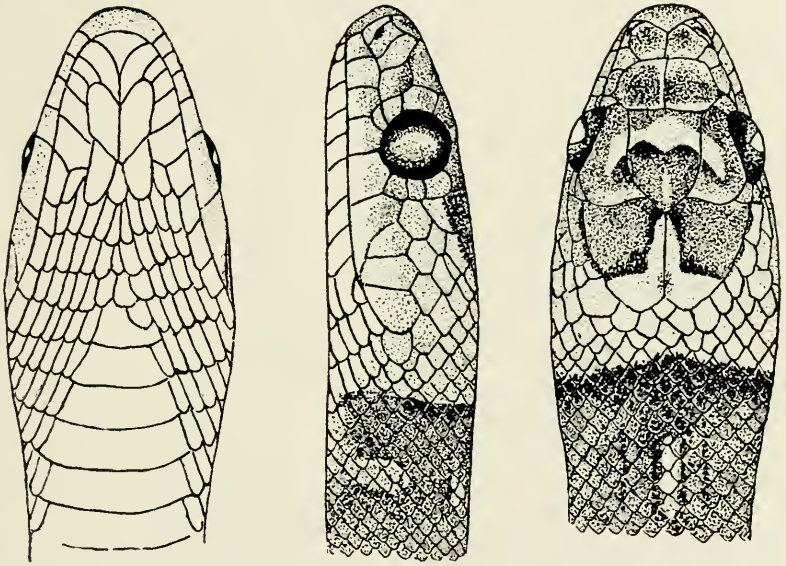

FIG. 8. *Trimorphodon tau* Cope. EHT-HMS, No. 5506; near Oaxaca, Oaxaca, Mexico.

temporals, 2 + 3 + 4, — 2 + 3 + 5; eight upper labials, but the posterior labials are irregularly divided into two, and on the other side in three parts, the lower part alone touching the labial border. Ten to eleven lower labials, the posterior lower labials largely concealed and lie partly horizontally; two pairs of chinshields, the anterior pair much the larger, in contact with four labials; second pair of chinshields separated by two scales (in a line), and separated from the first ventral by about four scales; seven scale rows between first ventral and last lower labial; mental narrower than rostral with a narrow elongate posterior extension. Scales smooth, in slightly diagonal, transverse rows, the median row not or but slightly enlarged, the two outer rows largest; scale formula: 34, 22, 21, 18, 14; (in

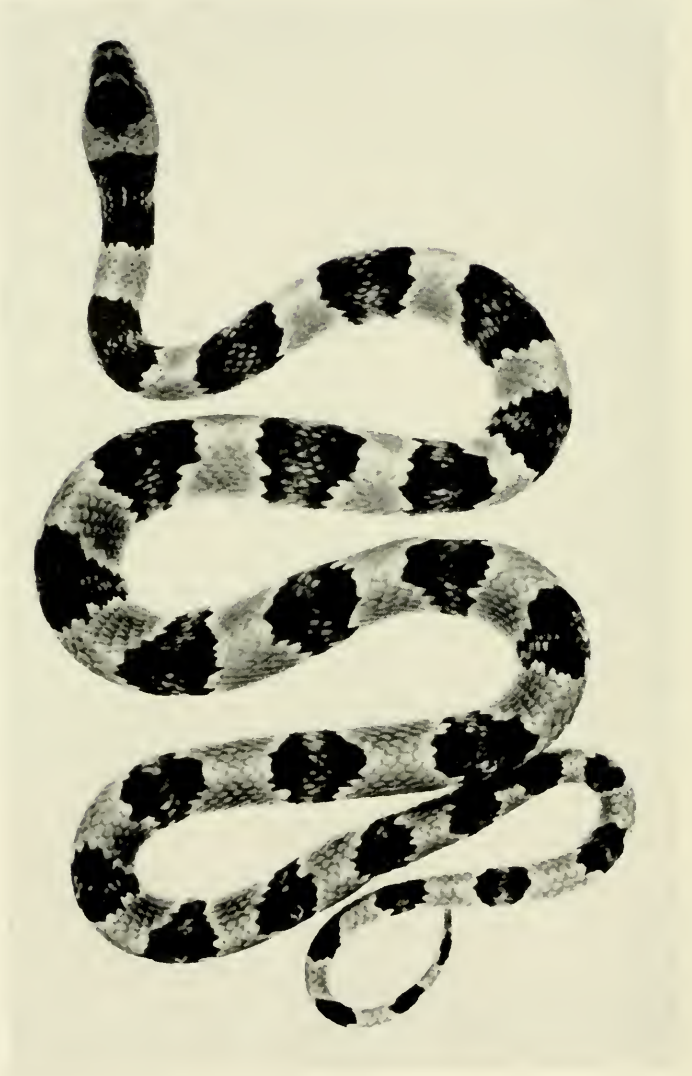

PLATE LI

Trimorphodon tau Cope. EHT-HMS, No. 5506; near Oaxaca, Oaxaca, Mexico. About natural size.

5507: 34, 23, 23, 20, 16). Most of the scales bear paired apical pits (head scales pitted, pits scattered save that those on frontal are in a lateral row on each side). Ventrals 206, subcaudals 70, total 276; (in the female, No. 5507), ventrals 220, subcaudals 57, total 276; measurements of 5506 and 5507, respectively, in mm.: total length, 537, 580; tail, 103, 84; head length, 16, 19; head width, 9, 13.

Color in life. Grayish-brown to faun above with a series of twenty-three rhomboidal, dark-brown spots on body and ten on tail, edged with black and bordered narrowly by gray-cream; the dark spots are five or six scale rows wide medially, narrowed to a width of two scales laterally, usually extending on ventrals; chin white; throat dirty ivory, washed slightly with salmon and becoming more salmon posteriorly; on sides of body some trace of salmon evident, on sides of venter the ends of rhombs are alternated with smaller black spots; the head has a broad spot curving anteriorly, notched behind, crossing anterior part of parietals and posterior part of frontal; above eyes, two forward-extending projections enclose a curved gray bar between eyes which has an anterior extension reaching more or less clearly to rostral; side of head gray-faun; first dark band begins about three scales behind the parietals and includes eleven scale rows on median line; it has a small longitudinal median light spot. The central portion of the rhombs are much lighter, nearly grayish in the middle (solid black in young type).

The second specimen has the dorsal spots somewhat lighter, there being twenty-six on body, and nine on tail; the mark between eyes is discernible, but the anterior projection is lacking. (In neither specimen is it as distinct as in type.)

Variation. Most of the variations have been mentioned. No. 5507 has the lower labials 12, 12, the upper labials 8-8. In this the seventh labial is segmented on the left side and only the lower segment touches labial border. It appears probable that the condition of six labials in the type is anomalous and apparently Cope suspected that the condition is anomalous. Further specimens from western Tehuántepec will be necessary to settle the problem.

Trimorphodon bi-scutatus (Duméril and Bibron)

Trimorphodon bi-scutatus Taylor, Univ. Kansas Sci. Bull., XXV, 1938 (1939), pp. 358-360, pl. XXXV, fig. 1.

One specimen obtained near Huajintlán, in southern Morelos (km. 133), shows a pattern similar to that on the specimen figured (*loc. cit.*). There are fifteen large blotches on the body and six on the tail; ventrals, 265; subcaudals, 82, total, 347; scale formula, 39-

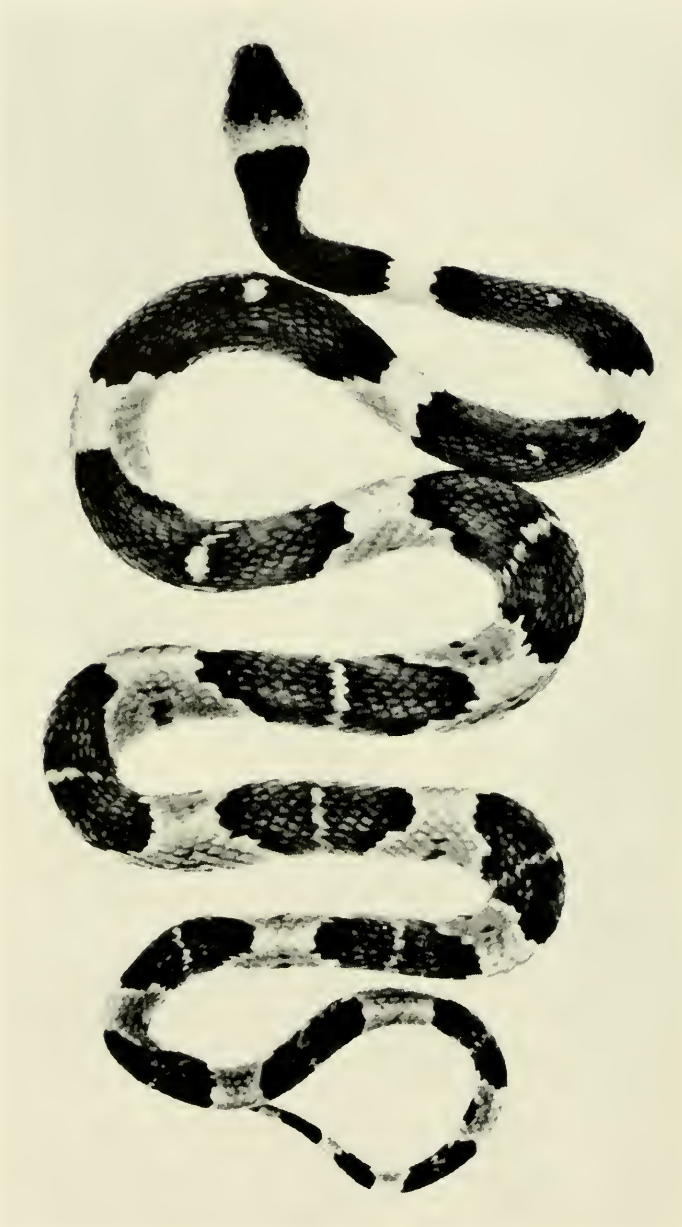

PLATE LII

Trimorphodon latifascia Peters. EHT-HMS, No. 5533; between Cuernavaca and Tepoztlán, Morelos, Mexico. About natural size.

(about head)-25-25-19-19; three pre- and three postoculars; three loreals; upper labials, 9-9; lower labials, 13-13.

Trimorphodon latifascia (Peters)

(Plate LII)

Trimorphodon latifascia Taylor, Univ. Kan. Sci. Bull. XXV, 1938 (1939), pp. 364-365, pl. XXXVI, fig. 2.

Several specimens of this rare snake were collected by me in 1938. Four specimens were taken on a newly paved road between Cuernavaca and Tepoztlán, Morelos (EHT-HMS Nos. 5533, 5534, 5535, 5538); five specimens were collected near Huajintlán, Morelos, at or near km. 133. (EHT-HMS Nos. 5536, 5537, 5539, 5540, 5541.)

The young specimen described by Taylor (*loc. cit.*) had the ground color red. The red color appears to be a juvenile characteristic, since adult specimens from the same and other localities show no trace of the red. The black bands of the young tend to become brown in the adult.

The general color of the body in this series of specimens is gray to faun. The darker bands have black edges and the centers are gray-brown, the scales darker on the edges. Many of the spots are severed by a transverse line of faun. The dark bands are usually interrupted medially on the venter, on the anterior part of body, but are more or less complete posteriorly.

Scale data on *Trimorphodon latifascia* (Peters)

Number	5533	5534	5535	5536	5537	5538	5539	5540	5541
Sex	♂	♀	♂	♂	♂	♀	♂	♂	♂
Loreals	3–3	3–3	3–3	3–3	3–3	3–3	3–3	3–3	3–3
Upper labials	8–8	8–9	9–9	8–?	9–9	9–9	8–9	8–8	9–9
Lower labials	12–12	13–13	13–12	12–12	12–13	13–13	12–13	12–13	13–12
Preoculars	3–3	3–3	3–3	3–3	3–3	3–3	3–3	3–3	3–3
Postoculars	3–3	3–3	3–3	3–3	3–3	3–3	3–3	3–3	3–3
Preocular touches frontal	yes	no	yes	yes	yes	no	yes	yes	yes
Ventrals	212	221	212	213	219	216	224	209	220
Subcaudals	74	46*	73	69	76	67	68	78	76
Total scales	286	267*	285	282	295	283	292	287	296
Second chinshields separated	yes	yes	yes	yes	yes	yes	yes	yes	yes
Spots on body	13	15	15	13	15	15	15	13	13
Spots on tail	7	3*	7	7	6	5	7	6	6

Scale counts of the series in the above order: 35, 23, 23, 23, 17, 15; 35, 23, 23, 23, 19, 16; 34, 25, 23, 23, 19, 14; 33, 22, 23, 23, 19, 15; 35, 21, 22, 23, 17, 15; 36, 21, 23, 23, 17, 16; 34, 22, 23, 23, 17, 16; 33, 21, 23, 23, 17, 14; 34, 25, 23, 23, 17, 15.

* Tail incomplete.

Leptodeira septentrionalis (Kennicott)

Leptodeira septentrionalis Taylor, Univ. Kansas Sci. Bull. XXV, 1938 (1939), pp. 329-331, pl. XXXI, fig. 3; text fig. 4.

Three specimens were taken in 1938. These are EHT-HMS No. 16146, from 20 km. south of Zacualtipan, Hidalgo, August 9, 1938; elevation about 2,300 meters; Radclyffe Roberts collector. No. 16147, about five km. northwest of Tianguistengo, Hidalgo, August 11, 1938, elevation about 1,700 meters, Taylor collector. No. 16148, 10 km. south of Linares, Neuvo León, September 13, 1938, Taylor collector. These specimens, in the order given, present the following data; sex or age, ♀, yg., ♂; ventrals and subcaudals, 199-81, 200-83, 192-75; anal, divided in all; spots on body and tail 29-17, 31-19, 22-10; preoculars, 3-3 in all; postoculars, 2-2 in all; temporals, 1+2+3 all; upper labials, 8-8, all; lower labials, 10-10, 10-10, 9-9; the upper preocular broadly touches the frontal; scale formula, 26-21-23-23-17, 27-21-23-23-17, 28-21-23-23-16.

Number 16148 differs markedly from the other two. It is a full-grown specimen, with the large tranverse black bars, reaching to outer scale row; the alternating bands are dull pinkish, one and one-half to two and one-half scales wide in middorsal line, and one-half to two scales wider at the outer scale row. This type of coloration is more typical of the northern, lowland forms. The dark bars on the young specimen are narrower than the intervening pinkish areas which expand to a width of five scales on the side; the dark bars reach the second scale row on sides, as is true of No. 16146. All have the pigment on outer edges of ventrals with the entire underside of tail more heavily pigmented.

Leptodeira splendida Günther

Leptodeira splendida Taylor, Univ. Kan. Sci. Bull., 1938 (1939), pp. 320-321, pl. XXX, fig. 2, text fig. 1.

A specimen of this species (EHT-HMS No. 5590) was captured under a stone near km. 170 on highway south from México, D. F.

The markings are typical with 24 spots on body and 17 on tail; preoculars, 4-3; postoculars, 2-2; upper labials, 8-8; lower labials, 10-10; two pairs of chinshields of near equal length; temporals, 1 + 2; scale formula, 27-21-21-19-17; ventrals, 166; subcaudals, 88; anal divided. The specimen is a young male with scales on posterior part of body keeled.

Tantilla bocourti (Günther)

Tantilla bocourti Taylor, Trans. Kansas Acad. Sci., 39, 1936, pp. 336-337, fig. 1; Taylor & Smith, Univ. Kan. Sci. Bull., XXV, 1938, (1939), p. 254.

The type locality of this species is "Guanajuato," (city or state?). The types are males, having 172, 176 ventrals; 55, 55 subcaudals.

A series of specimens from Western Mexico were collected by me on a hillside between Zitácuaro and the Rio Tuxpan in Eastern Michoacán. These specimens are EHT-HMS Nos. 15898-15908, and respectively have the following ventral-subcaudal counts: ♀, 186-53=239; ♀, 185-49=234; ♀, 180-57=237; ♀, 181-50=231; ♀, 179-52=231; ♀, 186-50=236; ♂, 170-58=228; ♂, 175-60=235; ♂, 165-54=219; ♀, 185-46=231; ♂, 166-58=224. The average of the totals for females is 234.2; for males 226.5. The maximum number of ventrals for the species is 186; the minimum being 165, a difference of 21 scales. This is indicative of a very wide sexual variation, the variation within each sex being only eight in females and ten in males. This lot shows almost the maximum-minimum variation of the species. I have one male with 163 ventrals from Cuernavaca, Morelos, and a specimen has been recently reported from Distrito Federal with 195 ventrals. This latter may represent a race of this species. It should be reëxamined.*

The following specimens from more Eastern localities have been collected; EHT-HMS Nos. 15913, 15914 from near Cocoloapam, about 22 km. northwest of Tehuacán, Puebla.

These specimens, in the order given above, have the following scale counts: ♂, 176-52=228; ♂, 176-48=224.

No. 5239, reported in Taylor and Smith, *loc. cit.*, from Cuernavaca has a prominent light spot on the anterior part of each parietal. A pair of spots on the suture between the parietals. The light collar is somewhat curving and the frontal is proportionally wider. No. 14431 is the largest specimen seen; it measures total length, 396 mm.; tail, 62 mm.

A large female specimen, No. 15915, is doubtfully referred to this species. It is from an unknown locality and differs in having the last two labials very high, the temporals 1 + 1 + 1, the last very large; there is a tendency for the nuchal collar to be interrupted medially. Ventrals 183; tail broken.

The lot of specimens (Nos. 15898-15908) from between Zitácuaro and the Rio Tuxpan, are rather constant in general characters. All are more or less dusky brown with a black or black-brown head.

* Dunn, Amer. Mus. Nov. No. 314, May 16, 1928, pp. 2, 3.

Three of the specimens show the unusual condition of having the last upper labial (the seventh) in contact with the parietal on one side or the other. In one specimen two labials touch the parietal on one side, and here there is no anterior temporal present. One of two specimens taken four miles east of lake Pátzcuaro, has the last labial touching the parietal on one side; the other specimen has the long anterior temporal segmented on one side into two scales.

Certain of the specimens have a decided reddish-brown coloration, which in two cases was associated with specimens with the presumed anomalous relationship between labial and parietal.

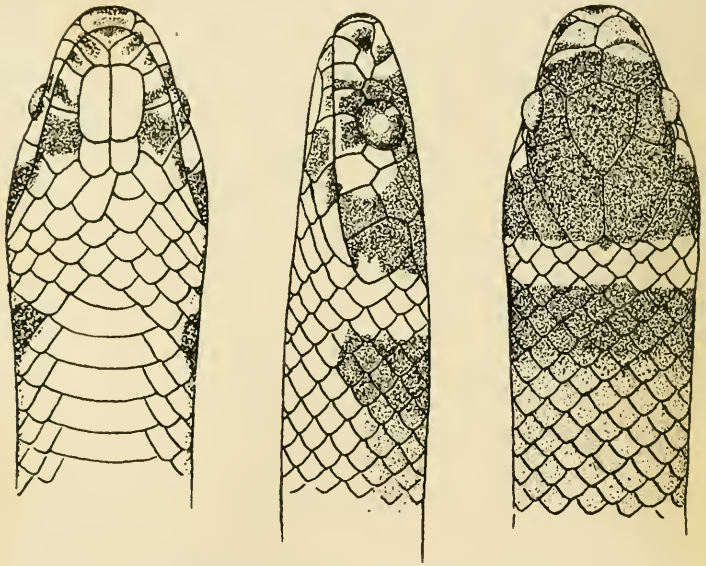

FIG. 9. *Tantilla rubra* Cope. EHT-HMS, No. 5241; 22 km. N. W. Tehuacán, Puebla, Mexico. ×4.

Tantilla rubra Cope

Tantilla rubra Taylor and Smith, Univ. Kansas Sci. Bull., XXV, 1938 (1939), pp. 253-254.

Two specimens were taken by me at km. 226, 22 km. northwest of Tehuacán, near Cocoloapam, Puebla. Both were bright pink above and below; the ring about neck, white; head black, the chin black and white. The pinkish color has disappeared in alcohol and the dorsal coloration is flesh tan; only a part of the scales show traces of pits.

Data from Nos. 15912, 15911, respectively: Ventrals and subcaudals, 162-65 ♂ ; 160-64 ♂ ; upper labials, 7-7, 7-7; lower labials, 6-6, 6-6; order of size in upper labials, 3, 2, 4, 1, 5, 6, 7, in both.

Tantilla martindelcampoi Taylor

Tantilla martindelcampoi Taylor, Trans. Kansas Acad. Sci. 39, 1936, pp. 347-348, fig. 6 (type description; type locality, El Treinte, Guerrero).

One specimen was taken in 1938 (EHT-HMS No. 15916) at El Limoncito, near Acapulco, Guerrero. Ventrals, 115; subcaudals, 38. It agrees in practically all other characters with the type.

Tantilla calamarina Cope

Tantilla calamarina Taylor, *Trans. Kansas Acad. Sci. 39, 1936, pp. 346-347, fig. 5.

In 1938 I collected three specimens of this species in an old lava flow between Cuernavaca and Tepoztlán (EHT-HMS Nos. 15941, 16256, 16257). The following variation from the figure 5 (Taylor *loc. cit.*), is evident.

No. 15941, ♂. The anterior angle of frontal is more obtuse; the posterior chinshields are a little longer; lower labials, 6-6; parietals longer than their distance to the end of the snout; the second labial touches the prefrontal and the fifth is in contact with the parietal; ventrals, 120; subcaudals, 38. No. 16256, ♀. The second labial enters the orbit minutely; the front edge of frontal nearly straight; 130 ventrals, 28 subcaudals. No. 16257, ♀. This agrees save that the fifth labial is minutely separated from the parietal, permitting the first temporal to touch the postocular. Ventrals, 130; subcaudals, 29.

Micrurus nuchalis Schmidt

Micrurus nuchalis Schmidt, Zoöl. Ser. Field Mus. Nat. Hist., Vol. XX, 1933, pp. 35-36 (type description; type locality Tapanatepec Oaxaca, Mexico. MCZ No. 27830).

A specimen of this rare snake, EHT-HMS No. 5085, which I collected in the edge of Acapulco, Guerrero, was sent to Dr. Karl P. Schmidt for identification. He comments that it is far northwest of the known range in Oaxaca.

The following characters obtain: Upper labials, 7-7; lower labials, 7-7, last small; preocular broadly in contact with the posterior nasal; one preocular, two postoculars; temporals, 1 + 1 + 1; ventrals, 220; anal divided; subcaudals, 55, all but third divided.

Snout black followed by a neck spot with a yellow band between; ten bands of black, edged with yellow, on body; four on tail, which are very much longer than those on body. Body bands about two to two and one-half scales wide bordered by yellow covering one scale row; the bands may break on outer scale row. Intervening

* A line was dropped from the first paragraph on page 347. Read: "Second pair of chinshields one-half or less of first pair; part of rostral visible above equal to between one-half and one-third of the distance between frontal and end of snout."

red areas are 17-23 scale lengths long, each scale flecked with brownish-black at its apex. Black bands on tail cover about twelve scale rows.

The specimen is male with the lateral scales above anus keeled or tubercled.

Micrurus laticollaris (Peters)

Micrurus laticollaris Schmidt, Field Mus. Nat. Hist., Zoöl. Ser., 20, p. 39, 1933, and 1936, p. 215-216, fig. 27.

The first specimen of this rare snake acquired (EHT-HMS No. 4578, Taylor, 1932) was from under a loose ledge of rock pried from a tiny cliff at Mexcala, Guerrero. The snake was coiled when it fell, but immediately became surprisingly active. Schmidt has published a figure of this specimen (1936, p. 216).

Two other specimens were acquired by Dr. Hobart M. Smith at El Sabino, Uruapan, Michoacán in 1936 (EHT-HMS 5083, and 5084). In color pattern they are very similar, but the black flecks on the red areas are not all equal, some forming small blotches covering two or three scales. These are very irregular and do not form rings of spots; posteriorly the spots are absent and the flecks are evenly distributed. There are eight black triads (three black bands separated by two yellow bands) separated by red areas in the first of the two; nine triads in the second specimen. In each the last triad extends onto the tail. On tail there is one caudal triad.

In the armature of the head only one significant difference obtains. In the Michoacán specimens the third labial contacts the eye, prefrontal, and the posterior segment of the nasal, separating the nasal and preocular; in the Guerrero specimen the preocular touches the posterior nasal and separates the third labial from the prefrontal. The upper labials are 7-7; lower labials, 7-7; one preocular and two postoculars; temporals, $1 + 2 + 2$; four labials touching anterior chinshields which equal second pair in length; frontal small, narrow, scarcely as long as its distance from tip of snout. These characters apply to all three specimens. The ventral-subcaudal counts are No. 5083, ♀, 224-14 + = ?; No. 5084, ♀, 225-42 = 267; No. 4578, ♀, 216-35 = 251.

Micrurus fitzingeri (Jan)

Elaps Fitzingeri Jan, Rev. Mag. Zoöl. 1858-1859 (1858), p. 521, type description; type locality, "Mexico"; & *idem* (1859), p. 10, pl. A; fig.

A specimen which I collected 18 km. north of Valles, San Luis Potosí (EHT-HMS No. 5515) is referred to this form with some

hesitation, since the color pattern, while agreeing with the type description in general, differs in certain detail of the color pattern. The color in life was as follows: Anterior black spot on head covers snout, tip of chin and the anterior labial, and extends dorsally to and includes the anterior two-fifths of the parietals; the yellow band following this widens on the side and includes most of the anterior temporal and most of the fifth labial. First black band encircles back part of head and neck, and connects dimly below with the black on tip of the chin. Counting this band, there are eighteen black bands covering about six scales above and four to five ventrals below; dorsally the bands are edged with continuous or disconnected yellow dots covering one scale or less; the intervening red bands bear dark flecks varying in size on the apices of the scales; ventrally the red areas may have dark flecks which may be confined largely to the outer edges of the ventrals. Tail with five wide black bands separated by narrow yellow bands (2 scales wide).

The frontal width and length, 2.2 mm. × 3.3 mm. The parietal length is 5.2 mm; the width of the preocular is 2 mm. The preocular touches the posterior nasal; temporals, 1 + 1 + 2; anterior chinshields shorter than the posterior. Ventrals, 207; anal divided; subcaudals double (save third), 43.

Micrurus affinis affinis (Jan)

Micrurus affinis affinis Schmidt, Zoöl. Ser., Field Mus. Nat. Hist., XX, 1933, p. 36.

There are two specimens (EHT-HMS Nos. 4577-5086) identified by Mr. Karl P. Schmidt as belonging to this species. They agree in the following characters. Upper and lower labials, 7-7; one preocular touching nasal; two postoculars; posterior chinshields longer than anterior. The scale formulae are, 19-15-15-15; 21-15-15-15; ventrals and subcaudals, ♂ 202-45-247; ♀ 224-36-260. In No. 4577, the spot of black covers the snout and anterior part of the lower labials; the yellow band following is narrow and runs forward on the sides of head reaching the second labial. The nuchal band is about five scales wide, and does not encircle the throat. There are ten very narrow, black bands on the body; five broad bands on the tail. Below, the body bands are about as wide as one ventral. In 5086 ♀, the nuchal band encircles the neck. There are twelve black bands, about the width of two ventrals, encircling body; four black bands on tail, 6 or 8 scales wide.

The former specimen is from Córdova, Veracruz; the latter from Cuautlapa, near Orizaba, Veracruz.

Agkistrodon bilineatus Günther

Ancistrodon bilineatus Günther, Ann. and Mag. Nat. Hist., 3d ser. XII, 1863, p. 364 (type description; type locality, Pacific Coast of Guatemala).

This species is represented in the collection by two specimens; EHT-HMS Nos. 5357 from El Sabino, Uruapan, Michoacán (head only); No. 5514 from km. 833 between Villagrán, Tamaulipas and Linares, Nuevo León, presumably in the latter state. It was encountered June 9, 1938, crawling on the highway pavement about dark.

The color in life was as follows: Head grayish-black above, more grayish on the sides of head and chin; a yellowish-white line from tip of snout along the canthus rostralis to angle of the jaw, where it joins a line originating on the anterior nasal which runs across the labials and across angle of the jaw; below the white line on labials, the lip is edged with amber-orange; a vertical stripe on rostral which is white with amber-orange center; this connects, when mouth is closed, with a stripe extending back from mental to the posterior chinshields and then bifurcates, the lines continuing back to first widened ventral. The lines are here joined by another white line; two amber-orange lines extend from sixth lower labial diagonally to the bifurcating lines.

Body generally lavender gray, traversed by lighter gray, irregular, saddle-like blotches, with interrupted amber-orange borders, which join and form a large amber-orange spot low on side; intervening areas may be divided by a very dim medial band, which joins a black, light-edged spot on the ventrals. Belly generally dark with amber-orange spots and reticulations. Tail yellow-green.

This specimen presents the following scale data: scale formula, 37, 28, 23, 21, 19; ventrals, 134 (last one fused with half of the divided anal); subcaudals, 35 single + 2 divided, + 3 single + 12 divided = 52. Tail terminates with three greatly thickened scales (abnormal?).

Compared with a No. 5357, the head scales differ as follows: frontal entire (broken into five parts, four anterior symmetrical); prefrontals in contact (separated by an elongate scale); rostral wide at the top (narrowed at top). In both specimens there are three preoculars; two postoculars, and one subocular; scale bordering pit below, elongate. Temporals, 6-5-4 (5-6-5). In both specimens there is a tendency for the parietals to be segmented irregularly or partially segmented.

ADDENDA

CORRECTION. In certain previous papers, errors have occurred and I take this opportunity of calling attention to them.

Univ. Kansas Sci. Bull., XXIV, No. 20, 1936 (1938), p. 529. Read *Kinonsternon integrum* Leconte, for *Kinosternon hirtipes* Wagler. Mr. Hartweg correctly identified the specimens. The use of *hirtipes* was wholly due to my error.

Univ. Kansas Sci. Bull., XXIV, No. 19, 1936 (1938), p. 492. Delete the synonym *Salvadora grahamiae* from *Salvadora grahamiae hexalepis* Cope.

Univ. Kansas Sci. Bull. XXV, 1938 (1939), p. 331. For "Dunn (1936) has proposed the placing of *Leptodeira septentrionalis* as a subspecies of *L. maculata*, and suggests that *L. maculata* replaces the form off the plateau." Read "Dunn (1936) has proposed the placing of *Leptodeira maculata* as a subspecies of *L. septentrionalis;* he suggests that *L. maculata* replaces *septentrionalis* off the plateau."

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Herpetological Miscellany No. I

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ABSTRACT: The paper treats of herpetological novelties from Mexico, Central and South America; the following new species are included: *Bufo gemmifer,* La Venta, Guerrero, Mexico; *Bufo mazatlanensis,* Mazatlán, Sinoloa, Mexico; *Tomodactylus angustidigitorum,* Quiroga, Michoacán, Mexico; *Tomodactylus macrotympanum,* Jacala, Hidalgo, Mexico; *Microbatrachylus* gen. nov. (type species *Eleutherodactylus hobartsmithi* (Taylor); *Microbatrachylus albolabris,* Córdoba, Veracruz, Mexico; *Microbatrachylus oaxacae,* Cerro San Felipe, near Oaxaca, Oaxaca; *Microbatrachylus minimus,* Agua del Obispo, Guerrero, Mexico; *Hyla melanomma,* 7 mi. east of Chilpancingo, Guerrero, Mexico; *Hyla forbesi* Acultzingo, Veracruz, Mexico; *Hypopachus ovis,* Tepic, Nayarit, Mexico; *Hypopachus maculatus,* San Ricardo, Chiapas; *Hypopachus caprimimus,* Agua del Obispo, Guerrero, Mexico; *Hypopachus alboventer,* 8 miles east of Cuernavaca, Morelos, Mexico; *Hypopachus cuneus nigroreticulatus,* Encarnación, Campeche, Mexico; *Leptotyphlops magnamaculata,* Utilla Island, Honduras; *Leptotyphlops rufidorsum,* Lima, Peru; *Leptotyphlops nasalis,* Managua, Nicaragua; *Leptotyphlops ater,* Managua, Nicaragua; *Phyllodactylus muralis,* Totolapam, Oaxaca, Mexico; *Phyllodactylus magnatubereulatus,* Acapulco, Guerrero, Mexico. Several other rare forms are discussed. Most of the new forms are illustrated.

THE following paper is based upon material that has been accumulating in the EHT-HMS collection for several years, but descriptions were held back in some cases in order to obtain more adequate series of specimens. It was originally intended to treat of certain of the genera monographically and in separate papers; but to do this would have delayed publication of the new forms for some time. Four of the species are described from specimens in the U. S. National Museum collection.

The excellent drawings are by Walter Yost, of the University of Kansas; the photographs by Dr. Oren Bingham, University of Kansas photographer.

Bufo gemmifer sp. nov.

(Plate LIII; figs. 3, 3a, 3b)

Type. EHT-HMS No. 18509; El Limoncito, near La Venta, Guerrero; June 29, 1938; E. H. Taylor collector.

Paratypes. EHT-HMS Nos. 18497-18508; topotypes, same date and collector.

Diagnosis. A large toad with strongly developed preorbital, supraorbital, postorbital and supratympanic crests; a canthal crest more or less developed; supraorbital crests forming continuous curves which diverge strongly; interorbital width much greater than width of an eyelid; only a faint suggestion of parietal crests; parotoid gland much smaller than eyelid; heel reaches to parotoid or slightly behind; snout sharply truncate; subarticular tubercles of hand usually bifid; these and supernumerary tubercles highly elevated, sharply conical; vocal sac usually with a single opening which may be sinistral or dextral (rarely double).

Description of the type. Adult male. Head broader than long, with a high, narrow, curving supraorbital crest which is continuous with the supratympanic crests, and together form a sigmoid curve; supratympanic crest forms a shelf which extends out above the tympanum, partially concealing the tympanum when seen from above; only a vague trace of parietal crests; very distinct post- and preorbital crests; canthal crests less clearly defined, extending to above nostrils; snout truncate, sloping sharply to the rather pointed tip of upper jaw; loreal region rather concave, the lores sloping rather sharply; tympanum subcircular, its greatest diameter (6.1 mm.) greater than half the diameter of the eye (9.7 mm.); tympanum separated from the postorbital crest by an appreciable distance; an indistinct, irregular crest, beginning below middle of eye, continues to below tympanum; width of an eyelid (7 mm.) less than narrowest width between the crests (9 mm.); supraorbital crests diverge strongly; width between the supratympanic crests (27 mm.) somewhat less than greatest width of the head (32.5 mm.); parotoid gland small, oval to subtriangular, lying somewhat diagonally behind the end of the supratympanic crest.

Tongue elongate, rounded and widened posteriorly, narrowed in front, free for little more than one-third of its length; choanae small, narrow, transverse, with a prominent transverse ridge behind each; opening of vocal sac dextral.

First finger larger and longer than second; two large palmar tubercles; distal subarticular tubercles of outer three fingers double or

bifid; strong conical tubercles on palm and sides of digits; inner surfaces of first finger with nuptial asperities which are present also on second and third. Foot more than a third webbed, the edges of the digits with a distinct serrate fringe; subarticular tubercles not strongly differentiated from other tubercles on digits and soles; inner metatarsal tubercle oval moderately salient larger than outer; a rather conspicuous irregular row of tubercles in place of a tarsal fold.

Skin strongly tubercular, with two rather prominent rows on back joining anteriorly just back of the parietal region; tubercles on sides a little larger than most of the tubercles on the back; tubercles conical, studded with one large and several small, horny spines (in females the tubercles usually have a single, rounded, horny tip); tubercles low, indistinct on dorsal surface of hand and foot; two or three enlarged tubercles behind angle of the mouth; two pairs of tubercles above the anus.

Color. A very indistinct median stripe and a very indistinct, diagonal, lateral stripe; head nearly uniform olive-gray, the crests dark black-brown; arms and legs irregularly barred or marbled with dark olive or blackish; posterior sides of femur reticulated with darker color; below dirty white (the pigment scattered between the tubercles); tympanum blue-black; under surface of hands and feet darker than venter; an inverted V-shaped black mark terminates the dim median light stripe anteriorly; lip cream, with horny tubercles and a rim of dark horn at edge.

Measurements. (Type and largest female; measurements in mm.); snout to vent, 90, 99.5; length of snout, 10, 9; length of eye, 9.7, 10.8; diameter of tympanum, 6.1, 6.7; length of parotoid, 8.3, 11; distance between supratympanic crests, 27, 30; arm, 52, 56.5; leg, 99, 107; tibia, 31.5, 36; foot, 45, 48.

Variation. The opening of the vocal sac varies. In five specimens the opening is sinistral, in four dextral, and in two, there was an opening on each side; in most of the specimens the tympanum was well separated from the crests; certain specimens have the limbs more conspicuously barred, and the median and lateral stripes contrast more with the general coloration; in others these stripes are almost entirely obsolete. Usually the subarticular tubercles of hand and the distal tubercle of the fourth toe is completely divided or bifid; more frequently only a pair of tubercles is present above the anus.

Remarks. The discovery of this species was a great surprise since I had collected in this general region on several previous occasions. On the night following the hurricane which occurred on

June 26, 1938, numerous amphibians were heard calling in the vicinity of my camp. The first night the following were heard calling and specimens of all were taken: *Bufo marmoreus, Bufo marinus, Microhyla usta, Hypopachus caprimimus, Hyla baudinii, H. staufferi, H. venulosa.* The second night following, the same species were heard or taken. The third night the numerous *Hyla staufferi* were replaced by *Hyla underwoodi,* and the *Bufo marmoreus* disappeared from the scene and were replaced by the species here described. On succeeding nights the species was not heard or found again, despite what appeared to be favorable conditions for their appearance.

This form is most closely related to *Bufo mazatlanensis* occurring in Sinaloa and Nayarit. These differ in having the crests somewhat less elevated; a shorter supratympanic crest; a more salient inner metatarsal tubercle, and only the third digit of hand with a divided subarticular tubercle. The smaller tubercles of sole and palm are much reduced. The parotoid gland is larger and placed farther forward. (Compare with *valliceps;* pl. LIII, fig. 2.)

The species name is in reference to the old belief that the toad carries a jewel in its head.

Bufo mazatlanensis sp. nov.

(Plate LIII, fig. 1; Plate LIV)

Bufo valliceps Taylor, Univ. Kansas Sci. Bull, XXIV, 1936 (1937), pp. 509-510.

Type. EHT-HMS No. 374; two miles east of Mazatlán Sinaloa, Mexico; July 20, 1934, E. H. Taylor coll.

Paratypes. EHT-HMS Nos. 373-379; same data.

Diagnosis. A large toad with a known maximum size (♀) 86 mm.; related to *gemmifer,* but with a pronounced dorsal stripe, narrower head, the parietal crests more distinct, shorter snout, a larger, more transversely placed parotoid; supratympanic crest shorter, not forming shelf above tympanum; all crests topped with black horny epidermis.

Description of the type. Head somewhat wider than long; crests high and narrow; well-developed supraorbital crest which curves behind eye to the supratympanic crest; postorbital and preorbital crests well developed, the latter narrowly separated from the low horncovered crest on the upper jaw; thickened canthal crests, more or less horn covered, extend to a point between nostrils; supratympanic crest does not or only slightly projects over the tympanum and does not conceal tympanum when observed from above; parietal crests moderately developed.

Snout very truncate the nostrils extending as far forward as the upper lip; loreal region somewhat concave; tympanum subcircular the crests forming the upper anterior border, its greatest diameter (6.1 mm.) much less than length of eye (8.5 mm.); latter slightly less than distance from eye to tip of snout (8.9 mm.); width of an eyelid (6 mm.) less than interorbital distance (measured from tops of crests, 9.3 mm.); width between the supratympanic crests (23 mm.) less than width of head (29 mm.); length of parotoid (10 mm.), lying diagonally, separated from eye by a distance of 6 mm., abutting against the termination of the supraorbital crest. Tongue elongate, rounded, widened posteriorly, narrowed in front, free for a third of its length; choanae moderate, a high ridge behind each; each with a curved anterior ridge, the innermost edge of which forms a toothlike free process (also in *gemmifer*); (character of vocal sacs in male unknown). Limbs more slender than in *gemmifer;* first toe longer than second; two large palmar tubercles; distal subarticular tubercle on third finger bifid; tuberculation on fingers and palm rounded, but not spinose or conical.

Tibiotarsal articulation reaches the tympanum; subarticular tubercles of toes single; supernumerary tubercles somewhat more conical on hand, but much less prominent and fewer than in *gemmifer;* foot nearly half webbed, slightly more extensive than in *gemmifer.* Inner metatarsal tubercle high, with slightly compressed inner edge, its greatest length about that of first toe; outer tubercle elongate; tarsal fold represented by a few, larger, spinose tubercles. Skin strongly tubercular, the tubercles tipped with brown horn (a single point in females or the entire tubercle covered except laterally and posteriorly, where there may be several horny points). Snout and lores with spots of brown horn; tubercles on sides largest; venter with equal, small, tubercles.

Color. An irregular median light cream line terminating at occiput; diagonal lighter lines on sides scarcely discernible due to marbling with brownish; on each side of median lines, indefinite darker and lighter brown areas; legs indefinitely barred and marbled with brown; venter immaculate yellow-cream; crests deep black or black brown.

Variation. Four paratypes are females and save for size are uniform for most characters; the color is similar save that No. 373 is much lighter than the type (three paratypes are skeletons).

Measurements in mm. Snout to vent, 85; length of snout, 7.2; width of head, 29; length of head, 24; arm, 48; leg, 95; tibia, 28.5;

foot, 44 (measurements of paratypes are given in Taylor [1937, *op. cit.*]).

Remarks. The type series was dug out of a pile of rock and earth only a few meters above sea level; their call was not heard.

In Taylor (1937, *op. cit.*) I state that the specimens were compared with *valliceps* from Guerrero. The locality should have been Veracruz. I have examined the type of *argillaceus*, and the present species is quite unrelated. In Kellogg (Bull. 160, U. S. N. M., 1932, p. 71) two specimens of *valliceps* are reported from Acaponeta, Nayarit. I rather suspect that the specimen is not *valliceps*, since it is several hundred miles out of the known range.

No further comparison with other Mexican toads is needed. (Compare figure 1, Plate LIII, with *valliceps*, Plate LIII, fig. 2, and *gemmifer*, Plate LIII, fig. 3.)

Tomodactylus angustidigitorum sp. nov.

(Plate LV; figs. 1, 1a, 1b)

Type. EHT-HMS No. 18640; collected at Quiroga (northeastern end of Lake Pátzcuaro), Michoacán, México, elevation 6,880 ft., September 5, 1938, by Edward H. Taylor.

Paratypes. EHT-HMS No. 3713, collected near San Martín, west México, August 3, 1932; Nos. 18641-18648, 18650, nine miles west of Zacapú, Michoacán, near Cerro de Tecolote, September 6 and 7, 1938; Nos. 21579-21588 collected four miles east of Carapa, Michoacán; all collected by E. H. Taylor.

Diagnosis. A small member of the genus, known maximum length 25 mm.; digits tapering, the terminations narrower than digits; lumbar gland very distinct, short, somewhat removed from groin; a discontinuous fold from eye to lumbar gland more or less distinct; parotoid gland distinct; abdomen strongly granular; tongue large, slightly nicked behind, free for nearly half its length; tympanum small, indistinct, separated from eye by a distance greater than its diameter; limbs relatively short, the heel not or scarcely reaching tympanum.

Description of the type. Head slightly narrower than body, the frontal region narrowed; canthus rostralis distinct, very slightly rounded; upper part of lores nearly vertical, then sloping to lip, leaving a broad, shallow depression between eye and nostril; interorbital width (2.35 mm.) only a little wider than eyelid (2.1 mm.); length of eye (3.5 mm.) about equal to length of snout (3.55 mm.), but somewhat shorter than distance from eye to the tip (3.8 mm.);

distance between nostrils equals distance of eye from nostril; tympanum small, indistinct, its diameter about .75 mm., separated from eye by a greater distance (1.1 mm.); snout pointed; nostrils not terminal, the distance from tip of snout being 1.2 mm. Tongue rather narrow, elongate, free for nearly half its length, slightly nicked behind; choanae lateral, vertically placed, seen from below they are concealed by projections from upper jaws; mucuous glands have small openings between choanae; openings of the vocal sacs large.

Arm brought forward the wrist reaches the tip of the snout; tips of outer fingers no wider than inner fingers; subarticular tubercles very large, rounding, not conelike; first finger shorter than second; a large median palmar tubercle; the outer palmar tubercle variable; that at base of first finger distinct; four or five other enlarged palmar tubercles and numerous smaller ones; small tubercles between the bases of adjoining digits and bordering basal edges, give a serrate appearance; an indistinct tubercle on wrist and elbow; leg brought forward the tibiotarsal articulation reaches to arm insertion or very slightly beyond; fourth toe long, the fifth very short and slender, the metatarsals of these toes united; subarticular and supernumerary tubercles conical, salient; sole with several large, and numerous smaller tubercles; a large inner metatarsal tubercle, and an equally large outer; no trace of a tarsal fold; when limbs are folded the heels touch.

Skin above relatively smooth; a few flattened, rather indistinct pustules on back; a dorsolateral lumbar gland separated from groin by an appreciable distance; running forward from the gland a more or less continuous fold reaches to near eye, not continuous with the very indistinct supratympanic fold; a parotoid gland lying somewhat diagonally behind tympanic region and extending to above arm insertion; abdomen and sides covered with relatively large granules; granules cover most of under side of femur and much of its posterior face; chin and breast smooth.

Color in life. Reddish-brown on dorsal surfaces with some indistinct darker flecks and spots; lumbar gland deep black and silvery white; chin pigmented with light blackish-brown; venter lightly pigmented with brownish-black, the summits of the granules silver; under surfaces of tibia more or less barred with brown and cream; dorsal and posterior part of femur more or less uniform brown; ventral surface of femur flesh; sides of head and lores blackish; snout somewhat more grayish than black.

Measurements in mm. Snout to vent, 24.2; length of snout, 3.55; snout to arm, 8.5; length of head, 9.3; width of head, 8; arm, 15; leg, 29; tibia, 9.2; foot, 15.2.

Variation. Most of the proportional measurements and the general structural characters of the paratypes agree with the type. In color they vary to a considerable extent, some being nearly uniform gray-black above; others are deep brown, while still others are brownish-gray with black spots; one specimen shows rather distinct bars on the femur. Females are usually flesh below—and less pigmented than the type. A few have a rather indistinct light bar between the eyes as occurs in other species. The fold from eye to the lumbar gland may be broken into a row of short folds or pustules. In some the tympanum is entirely concealed, but usually its outline can be discerned. In most the border of the ventral disk is very indistinct.

Specimens were encountered hopping about on the ground or ensconced under stones. The voice has not been heard. No specimens were found in trees. The narrowed tips of the digits, the shortened limbs and the poorly developed disk may be stigmata of a terrestrial habitat, despite the fact that none have been encountered save in forested areas. *Tomodactylus nitidus,* another terrestrial species, has been taken largely in open fields far from forest.

Of the known species, the relationship is probably closest to *Tomodactylus amulae* Günther. This species lacks narrowed tips on the toes.

Tomodactylus macrotympanum sp. nov.

(Plate LV; figs. 2, 2a, 2b)

Type. EHT-HMS collection No. 6838; collected south of Jacala, Hidalgo, Mexico, July 2, 1936, by Edward H. Taylor.

Paratypes. EHT-HMS Nos. 6815-6837, 6839-6840, collected 8-18 miles south of Jacala (by highway) chiefly at a point on highway marked La Placita, and a tiny village Minas Viejas. Same date and collector.

Diagnosis. A large member of the genus (known maximum size 31 mm.), with the lumbar gland moderately distinct, extending to groin, not colored black and white; tympanum large, very distinct, more than three-fourths diameter of eye; abdominal disk more or less distinct; abdomen not granulate save on sides, and very indistinctly granulate posteriorly; enlarged terminal disk on two outer fingers nearly double the smallest width of these digits.

Description of the type. Head about as broad as body; the in-

terorbital distance (3.7 mm.) much greater than the width of an eyelid (2.4 mm.); length of the eye (3.4 mm.) less than length of snout (4.6 mm.) but equal to the distance to nostril; diameter of tympanum (2.6 mm. wide, 2.9 mm. high), equal to or slightly more than three-fourths length of eye; the rim of the tympanum thickened, overhanging the angle of the mouth; canthus rounded, the lores sloping; region about nostrils only slightly raised, lacking groove or depression between them.

Tongue small, pyriform or bottle-shaped, apparently not nicked behind; choanae lateral, when seen from below almost wholly concealed under the projection from the jaw; vocal sacs present, the openings elongate; the sacs indicated on the sides of chin by longitudinal folds.

Arm brought forward, nearly half of forearm extends beyond snout; terminations of two outer digits thickened, truncate, nearly twice as wide as the narrowest part of digit. Subarticular tubercles very large, rather rounded, with dim supernumerary tubercles; three posterior palmar tubercles, the median largest more or less contiguous with the outer (smallest); two other large, and several smaller tubercles on palm; other small tubercles between and bordering inner basal edges of digits; one or two tubercles on under side of forearm near wrist; other tubercles present on elbow; leg extended, the tibiotarsal articulation reaches eye; digits thickened, but not or slightly widened at tips; no webs, but a thickened tubercle between the bases of adjacent digits may represent a remnant; subarticular tubercles and to a lesser extent the supernumerary tubercles strongly salient, conical in shape and pointing slightly forward; sole of foot with about ten enlarged tubercles with numerous smaller granular tubercles; a large inner metatarsal tubercle; outer somewhat smaller; no trace of a tarsal fold; small tubercles on heel; free part of the third finger much longer and extending slightly farther forward than fifth.

Skin above rather roughened, with scattered pustules; upper surface of limbs smooth, with a few indistinct pustules on exposed surface of leg; sides of neck and body and the posterior part of abdomen covered with more or less distinct, flattened granules; more than half the under surface of femur granular, and part of the posterior surface; the granules of the back part of the underside of femur are more or less fused, forming transverse rows. A large lumbar gland extending nearly half the distance between axilla and

groin, somewhat granular above, with pits (visible under the lens); the edges of the glands are not strongly defined save by the presence of the pits; an ill-defined parotoid gland lies behind the tympanum above the arm and is likewise pitted. Two or three tubercles behind lower part of tympanum; the ventral disk is more or less distinctly outlined.

Color. Above gray, with a darker, somewhat symmetrical area extending from between eyes to rump; a gray bar connects the eyes preceded by a darker spot; other dark flecks on sides and dorsolateral region; exposed surfaces of arms and legs with darker flecks or bars. Femur and foot grayish, with alternating cream and gray areas scarcely differentiated. Below cream-flesh with a thin peppering of pigment. Front face of femur and groin with less pigment. A few light spots on upper and lower lips.

Measurements. Snout to vent, 29.3 mm.; length of snout, 5 mm.; snout to foreleg, 10.5 mm.; width of head, 11.1 mm.; length of head, 11 mm.; arm, 19 mm.; leg, 42.4 mm.; tibia, 13.3 mm.; foot, 21.2 mm.

Variation. In most of the structural characters listed the paratype series is practically uniform. In the distribution of pigment on the dorsal surface there is considerable variation. In some specimens the pigment is scattered in small dark flecks on the gray ground color; in others there is greater concentration of the pigment and there are fewer, but larger spots. The light bar across the head is usually evident, and some of the specimens have no darker area preceding the bar. In practically all, the chin, throat, breast and most of the abdomen are smooth. Folds on chin may be wanting.

Remarks. Most of the specimens are males. They were for the most part obtained from low trees and shrubs at an elevation between 6,000 and 7,000 feet, on a rainy night. The call sounds much like a short whistled note, pitched about five notes above middle C. Perhaps blinded by the light, they remained quiet at my approach. The call is such as to render its source difficult to locate. However, once found, the specimens were taken without difficulty.

The relationship is probably with *Tomodactylus nitidus* from which it differs in the much larger, more distinct tympanum; skin less pustulous above; longer legs, and the heels overlapping when folded at right angles. The lumbar gland less distinct and not strongly marked in black and white. Terminations of outer fingers more widened.

This adds another species to the distinctive fauna of the state of Hidalgo.

Among the specimens of Eleutherodactylid frogs collected in Mexico during the last eight years by Doctor Hobart M. Smith and myself are some three hundred small specimens, referable to several species which have, in combination, characters that seem to warrant their separation into a genus of their own. Two of these I have already described in the genus *Eleutherodactylus,* aware that such an association was not wholly justified. I now propose the following genus for their reception:

MICROBATRACHYLUS genus novum

Genotype: Eleutherodactylus hobartsmithi Taylor

Generic description. Very diminutive frogs; hand and foot lacking trace of web; outer metatarsals united; terminal disks present or absent; no vocal sacs, or chinfolds; no vomerine teeth; tongue thick, shaped like a grain of maize, free for a third of its length; a flat inguinal gland; ventral disk on venter broadly triangular, terminating on thighs; gonads with black pigment; an elongate, narrow, cartilagenous omosternum; sternum of cartilage, the posterior extension narrowed medially; the termination indistinctly bifid.

It is especially surprising that these small species have not been encountered by earlier collectors. It is possible that some specimens exist in other collections masquerading under false nomenclature. That these are not the young of various species of *Syrrhophus, Tomodactylus* and *Eleutherodactylus* is attested by the presence of fully adult males and females of the several species. Moreover, the young of most of the known Mexican species are at hand and these are easily identified, since most of the specific characters (size excepted) are evident in newly transformed young. I am of the opinion, based on the size of the ovarian eggs and the presence of specimens in places where standing water is not readily accessible, that most Mexican species of *Eleutherodactylus** have direct transformation without a protracted free-swimming larval stage. Thus specific characters are not obscured by adaptations resulting from the free-swimming larval life.

There is strong sexual dimorphism in *Microbatrachylus* as regards size, and in the diameter of the tympanum. Most of the species are terrestrial in habit, although there is a report of specimens of *hobartsmithi* having been taken in low plants (Taylor, 1937, *op. cit.*).

The following species are recognized: *Microbatrachylus hobartsmithi, pygmaeus, albolabris, oaxacae* and *minimus.* Further study on other forms is necessary and these are not included.

* *Eleutherodactylus rugulosus*, is apparently an exception since the newly transformed young are abundant along streams. (Possibly *E. natator* and *vocalis* also are exceptions.)

Microbatrachylus pygmaeus (Taylor)

Eleutherodactylus pygmaeus Taylor, Trans. Kan. Acad. Sci., 39, 1936 (July 2, 1937), pp. 252-254, pl. 1, figs. 3-4 (type locality, one mile north of Rodriguez Clara, Veracruz).

The type of this species is a female. The two paratypes listed belong to two other species of this genus.

A series of specimens belonging to this species was obtained in Potrero Viejo, and Cuautlapa, Veracruz, since the type description was published. Most of the specimens were obtained, both during the day and the night, by tracing their feeble chirps. This usually entailed some difficulty since they are active and their alert movement makes them difficult to find in grass and leaves. All were on the ground.

The males of the species are diminutive, the largest of sixteen measuring 16 mm., while most of the others are less than 15 mm. in snout to vent measurement. The largest of fourteen females measures 19 mm. in length. It would appear that the sexual dimorphism as regards size is distinctly less than in *hobartsmithi*. The size of the tympanum is distinctly greater proportionally in the males than in the females of that species. The males of *pygmaeus* have large tympani, their diameters equal to about four-fifths or more of the diameter of the eyes. In both sexes the characters of the widened tips of the digits, the absence of a tarsal fold or row of tubercles on the tarsus, the absence of a small outer palmar tubercle, the presence of an axillary gland, the absence of vomerine teeth, the presence of the large inner metatarsal tubercle two to three times the size of the outer, may be regarded as constant. I find no vocal sac in the males. The tibiotarsal articulation usually reaches the eye or at most only slightly beyond.

The dorsal markings vary considerably, but the inverted V-shaped marking on the shoulders is invariably present; two small spots are present, in the dorsal lumbar region, and a dark diagonal mark from eye to the side, passing behind the arm, is usually present. A few specimens have a dark interorbital bar, and a dark stripe on the lores is more or less distinct.

The general color of live or newly preserved specimens is lavender or purple, there being no red or rosy color visible as in *hobartsmithi*.

The data in the type description taken from the paratypes must be disregarded as these specimens do not belong to this species.

The following specimens are referred to this species: Nos. 6419-6422, 6430-6436, 18187, Cuautlapa, Ver.; Nos. 18127, 18128, 18185-18187, 21612-21614, 22061, 22061A, 22063, Potrero Viejo, Ver.; Nos.

6423, 6437, San Juan de Gracia, Ver.; Nos. 6425, 6426, 6438, Córdoba, Ver. All collected by E. H. Taylor.

Dr. Hobart Smith informs me that he obtained nearly two hundred specimens of this species in the general region about Potrero Viejo, Veracruz, during the winter of 1938-1939.

Microbatrachylus hobartsmithi (Taylor)

Eleutherodactylus hobartsmithi Taylor, Trans. Kan. Acad. Sci., 39, 1936 (July 2, 1937), pp. 355-357, pl. 1, figs. 5-6 (type locality Uruapan, Michoacán).

This species was described from a male type, and only males are present in the paratype series. All were found at night by tracing their calls. I collected a series of forty specimens from among grass and weeds near the edge of a small stream about ten miles west of Villa Victoria, México, September 1, 1938. These were taken in the daytime, and no calls were heard. The lot contains only eight males. The females are proportionally very large, reaching a length of 22.5 mm., and more than three times the bulk of the males. The longest male has a snout to vent length of only 15.1 mm. The larger females contain large, nearly ripe eggs. The size of the eggs suggest that they have a direct mode of development rather than one involving an aquatic larval stage.

The color patterns are for the most part more strongly defined than indicated in the type figures. The ground color is a pinkish-gray with blackish markings, which are more or less symmetrical on the back. The dorsal and ventral surfaces of the femur are light red. The upper arm is of a rosy cream. The chin and venter are dull flesh or occasionally rosy flesh with a scattering of pigment, usually heavier on the chin and breast; in males and a few females the chin is rather blackish. The limbs are more or less barred in all specimens. The tympanum in males is often of almost the same diameter as the eye; in females it is proportionally much smaller, varying from about one-half to two-thirds the eye diameter. In most of the specimens the tongue is a little longer than in the type, with nearly two-fifths of the posterior part free. I am unable to find openings to the vocal sacs, in these males, and a reëxamination of the type shows folds along the sides of the floor of the mouth, but the openings were probably made with a probe. The statement that vocal sacs are present is to be regarded as incorrect.

The granulation of the venter is confined to the posterior parts. Proximal parts of the underside of the femora and a broad triangular patch on their posterior faces, lying below anus, also granular. In

most of the specimens the inner metatarsal tubercle is very large, its length equal to about two-thirds the length of the inner toe above the tubercle, and distinctly larger than the outer metatarsal tubercle. In several specimens the basal subarticular tubercle of the fourth toe is double. The gland in the groin, not mentioned in the type description, is present in all specimens, including the types.

The following specimens, other than the types, are in the collection: Nos. 18292-18352, ten miles west of Villa Victoria, in western part of México, September 1 and September 10, 1938, E. H. Taylor. No. 18353, twenty miles west of Guadalajara, Jalisco, September 11, 1938, R. Roberts. No. 21610, Mirador, Atzimba National Forest, Michoacán, September 3, 1939, E. H. Taylor.

Microbatrachylus albolabris sp. nov.

(Plate LVI; figs. A and B)

Type. EHT-HMS No. 6407, collected two miles west of Córdoba, Veracruz, August 20, 1936, by Edward H. Taylor.

Paratypes. EHT-HME No. 6407A, near Córdoba, 1936, by Radclyffe Roberts. Nos. 18802, Potrero Viejo, Veracruz, July 12, 1938; No. 18803, San Juan de Gracia, Veracruz, July 17, 1938, by E. H. Taylor.

Diagnosis. A small species lacking vomerine teeth and vocal sacs; tibiotarsal articulation reaching to back part of eye; nostril midway between eye and tip of snout; tympanum of female about three-fifths that of male, five-sixths diameter of eye; flat inguinal gland of greater extent than eye; outer metatarsal tubercle oval, three-fourths the length of first finger, about twice the size of outer tubercle; no tarsal fold; ventral disk terminating at femora; chin and entire venter without trace of granulation; a white stripe from near tip of snout below tympanum to above arm, separated from edge of lip by a broken, black line. A dark, irregularly-edged, middorsal stripe bordered by two gray-cream stripes; these in turn bordered by two grayish-black lines.

Description of the type. A small frog, the known maximum length less than 18 millimeters; head narrower than body, flattened; eyes not strongly salient dorsally; snout oval; nostril practically midway between eye and tip of snout; distance between nostrils (1.9 mm.) about three-fourths distance from eye to tip of snout (2.7 mm.); diameter of eye (2 mm.) greater than that of tympanum (1.25 mm.); width of upper eyelid (1.3 mm.) equal to interorbital width; canthal region somewhat rounded, the lores sloping abruptly, somewhat concave behind nostril; tongue longer than wide, the

posterior edge rounding, not notched behind, the posterior width about one-fourth greater than the anterior width, free for one-third its length; choanae small, lateral, completely concealed by projections of upper jaw when seen directly from below.

Arm short, laid forward the wrist does not reach tip of snout; first finger shorter than second; subarticular tubercles distinct, rounded, moderately salient; a large tubercle at base of first finger; a large, rounded, median palmar tubercle; no trace of an outer tubercle; five supernumerary tubercles on palm; tips of two outer fingers with disks having a terminal groove; the disks at least one-third wider than the width of the digit; those of inner fingers scarcely wider than digit; no trace of a web; a row of rounded tubercles on under surface of forearm; leg rather short, the tibiotarsal articulation reaching the posterior corner of the eye; disks on toes slightly larger than those on fingers, with a terminal groove; subarticular tubercles large, somewhat salient; only one or two supernumerary tubercles, these on the back part of sole; inner metatarsal tubercle oval, nearly three-fourths the length of the first toe; outer tubercle more than half as large as inner; when limbs are folded at right angles the heels overlap a little.

Skin above on head and body with tubercles and folds; a median hair-fine ridge from snout to anus; a pair of indefinite folds begin at eyelid in interorbital region, converge to a point on shoulders where they run parallel for a short distance, then they diverge, then converge, and run parallel for a distance. Again they diverge, and again converge and run more or less parallel to rump, where one or two larger tubercles are to be found; a discontinuous fold or row of tubercles begins behind eye and follows the dorsolateral region to groin; another indefinite row of tubercles runs back from the dim supratympanic folds; sides of body with other indistinct tubercles more or less in rows; the folds above tympanum not pronounced; the gland behind and below tympanum distinct, having characteristics of the gland in groin; latter large, flat, the minute glandules visible through skin; chin, breast, abdomen and the greater part of the underside of femora very smooth; a proximal area on ventral and posterior faces of femur granular. Ventral disk indicated by a transverse fold on breast and two curving lateral folds which converge and terminate medially on limbs.

Color in life. Above grayish-cream, with a slight pink or rose cast; top of head dark, inclosing a grayish spot, the anterior edge of which is trifoliate; two dark lines begin on orbital edge of upper lids, fuse on occiput and continue back to rump as a broad, irregu-

larly edged stripe occupying all the area between the median folds; a dorsolateral dark stripe borders the dorsolateral row of tubercles below; a dark, irregular stripe through lores, across tympanum, above arms to the side, its lower edge deep black; a white stripe beginning near tip of snout borders the dark stripe to side; a broken black line on the edge of lip; an ill-defined dark line on lower lip; chin, throat and venter immaculate greenish white; two or three black spots on anterior face of arm and one or two on posterior face; palm purplish; fingers strongly barred above; a brown stripe on anterior face of femur, darkest at knee; very indefinite bars on femur and tibia; sole and heel purplish; toes dimly barred above.

Measurements in mm. Snout to vent, 16.5; length of snout (median), 2; length of head, 5.4; width of head, 4.9; arm, 7.9; leg, 23.1; tibia, 7.3; foot, 10.

Variation. No. 18803 has been preserved in too weak a solution of the preserving fluid and has bloated slightly so that all trace of rugosities or folds on the body have disappeared. The color and markings are similar; the limbs are darker and the dorsal dark and light markings are less contrasted. No. 18802 has the dorsal cream stripes only faintly visible and narrower than in the type; in 6407A, the specimen has become brownish; there is a faint, light hair line in middorsal region, connecting with a similar transverse line on the back of the thighs which passes below anus.

Two specimens from Guerrero are tentatively referred to this species. They differ in certain points, but the median dorsal folds are similar, and a white stripe containing some scattered pigment is present on lip and lores, running back above and behind arm. Both specimens are larger, with proportionally larger outer metatarsal tubercles, which are somewhat squarish, their free edge directed inward. No. 6408 (1½ mi. N. of Mazatlán, Gro.) is a female with tympanum about two-thirds the diameter of eye; No. 21611 (Agua del Obispo, Gro.) is a male, the tympanum minutely less in diameter than the eye. In the female the borders of the ventral disk form very ample folds. The largest measures 17.8 mm.

Comparisons. This form differs from the white-lipped *Eleutherodactylus beatae* by the absence of a tarsal fold, or tarsal tubercles, larger tympanum and shorter legs. By the presence of the white stripe on the lip it differs from other members of this genus.

Microbatrachylus oaxacae sp. nov.

Type. EHT-HMS No. 18197, collected on Cerro San Felipe, near Oaxaca, Oaxaca, Mexico, August 18-22, 1938, by E. H. Taylor.

Paratypes. EHT-HMS Nos. 18188, 18189, 18191-18196, 18198, 18203, 18205-18207. Same data as type.

Diagnosis. A diminutive species with three palmar tubercles, the outer large, distinct or partly fused with the median; choanae not concealed under overhanging jaw when seen from below; digits not dilated; and indistinct parotoid gland above arm behind typanum; a small gland just posterior to axilla; inguinal black spots wanting; generally pinkish or rose color in life; sexual dimorphism not marked.

Description of type. Known maximum size 18.1 mm. (male). Head nearly as broad as body; snout rather oval; canthus rostralis distinct, but somewhat rounded; lores sloping broadly to lip; the loreal region slightly concave behind nostril; eyes not salient above; width of an eyelid (1.7 mm.) distinctly narrower than the interorbital distance (2.2 mm.); length of eye (2.2 mm.) greater than its distance from nostril, less than length of snout (2.8 mm.); nostril a little closer to tip of snout (1.3 mm.) than to eye (1.7 mm.); diameter of the circular tympanum (2.1 mm.) practically equal to that of eye.

Tongue much elongated (paratypes show a much shorter tongue), free for at least half its length, not or but slightly notched behind; no vocal sacs; no vomerine teeth; choanae lateral, not concealed by the projection of jaw when seen directly from below; area of palate anterior to choanae much reduced.

Arms short, brought forward the wrist fails to reach snout tip; first finger shorter than second; subarticular tubercles very large, rounding, as wide or nearly as wide as the digits; five small supernumerary tubercles on palm; three posterior palmar tubercles, the median largest, contiguous posteriorly with the outer palmar tubercle, or partly fused with it posteriorly; a dim fold under arm, elevated at two or three points with tubercles; small pads on tip of digits lacking a groove, not wider than the digit; legs long, the tibiotarsal articulation reaching tip of snout; limbs folded at right angles, the heels overlap two millimeters; outer metatarsal tubercle about two-thirds the length of first toe, moderately elevated, oval; outer more than half as large; toes with pads not or only minutely wider than toes; subarticular tubercles large, longer than wide, moderately elevated; a well-defined supernumerary tubercle on fourth toe between the two proximal tubercles; sole with several dimly indicated tubercles; no tarsal fold from inner tubercle; a row of tubercles run along outer side of tarsus from outer tubercle.

Skin above rugose, pustular, forming a pattern with indistinct folds and pustules; a pustular fold begins at posterior corner of eye,

runs back diagonally to a large tubercle on shoulder which is widely separated from its fellow; situated posterolaterally from this is another enlarged tubercle, which is continuous with a fold that runs posteriorly to groin, broken up into tubercles; beginning at the shoulder tubercles are two fine folds, one on each side, which tend to converge, then run parallel to each other, then diverge to join the outer row of tubercles. Arms finely pustulate, legs heavily pustulate, the largest pustules on the dark markings; sides pustulate or tubercular; a small (yellow) gland behind axilla and a larger, flat gland in groin; venter very dimly granular in the posterior half; throat and breast quite smooth; a broadly triangular, very distinct suction disk on venter, terminating posteriorly on thighs; a small parotoid above arm and a large tubercle back of lower part of tympanum.

Color in life. General ground color pink or roseate above; concealed parts of hind limbs pink; venter yellowish-white to ivory, with scattered, minute flecks of pigment forming a dim reticulation enclosing lighter spots; chin and throat darker; head grayish and black, with spots on lips; a loreal stripe, more or less distinct; dim, radiating lines on edge of eyelid above; a light gray bar between eyes, followed by a blackish bar; two x-shaped marks on shoulders; dim, dark marks on back; a dark spot above tympanum; limbs distinctly barred; palms, soles and undersurface of digits dark, the tubercles cream.

Measurements in mm. Snout to vent, 18.1; snout, 2.8; width of head, 7.3; length of head, 7.2; arm, 11.1; leg, 35.2; tibia, 11.4; foot, 15.

Variation. The series is very uniform in general characters, save that the dorsal pustular patterns may be dim. Females have smaller tympani, which are more or less oval, higher than wide—the longitudinal diameter about two-thirds of the eye, and its edge farther from the eye than in the males; the inguinal gland, and the parotoid glands, are usually smaller, and the latter a little less distinct than in the male. The size of the females in the collection is no greater than that of the males.

The closest relationship is apparently with *M. hobartsmithi.* The dorsal pattern of folds and pustules (tubercles) of that species is different; there is very great sexual dimorphism; the outer palmar tubercle is lacking; and the tibiotarsal articulation rarely reaches a slight distance beyond eye.

All the specimens were estimated to have been taken between an elevation of 7,000 and 8,000 feet. None were seen at lower eleva-

tions. All were taken on the ground among leaves. Three specimens of another small Eleutherodactylid were taken with these; they are believed to be the young of *E. mexicanus*. No adults of that form were taken.

Microbatrachylus minimus sp. nov.

(Plate LVI; figs. C, D)

Type. EHT-HMS, No. 6416, Agua del Obispo, Guerrero (km. 350) in pine forest, August 1, 1936, E. H. Taylor, coll.

Paratypes. EHT-HMS, Nos. 6411, 6413, 6415, Agua del Obispo, 3689 near Mazatlán, Guerrero, E. H. Taylor, coll.

Diagnosis. Small frogs; tympanum (of males) as large as eye; inguinal gland present; nostril nearer snout tip than eye; outer toes and fingers with widened disks; heel reaches middle of eye; no outer palmar tubercle; no postaxillary gland; a pair of broken, dorsolateral folds arising some distance behind eye; a second broken fold from above tympanum; lip spotted with black; lavender and purple above.

Description of type. A diminutive species (known maximum length for males, 15 mm.; for females, 19 mm.); head a little narrower than body, the eyes moderately prominent; eyelid (1.2 mm.) smaller than the interorbital distance (1.75 mm); tympanum large, subcircular, longer than high, its greatest diameter (2 mm.) equal to eye (1.95 mm.); distance between nostril and eye (1.3 mm.) greater than the distance of nostril to tip of snout (.95 mm.); snout rounded at tip, the length, 2.2 mm.

Tongue rather thick, rounded anteriorly and posteriorly the sides more or less parallel, free for more than one-third of its length; no vomerine teeth; choanae small, lateral, not or but partly concealed when seen from below; no vocal sacs.

Arm brought forward the wrist reaches near the tip of snout; tip of two outer fingers dilated into disks, with a terminal groove; the inner fingers not wider than digit; subarticular tubercles large rounded; fine supernumerary tubercles on palm; two large palmar tubercles, the median one largest; the outer entirely wanting; a row of tubercles under forearm; a distinct tubercle or swelling at the wristfold; arm more or less rugose; when legs are folded at right angles to body the heels barely touch; tibiotarsal articulation reaches to middle of eye; digits of second, third and fourth toes dilated with pads having a terminal transverse groove; subarticular tubercles strong; supernumerary tubercles on the foot almost obsolete, their location indicated by cream spots; inner metatarsal tubercle large, salient, about two-thirds the length of first toe; outer metatarsal

tubercle small, one-fourth size of inner; tarsus lacking an inner fold, three small, indistinct tubercles on the outer side.

A broken irregular fold runs back dorsolaterally, limiting light dorsal coloration; region between very rugose and pustular, but no distinctive pattern can be discerned. A second broken fold runs on the side beginning above the tympanum; sides granular or tubercular as are eyelids; ventral disk well-developed, terminating on thighs; chin throat and all save posterior part of abdomen smooth; most of ventral surface of thighs smooth, but the strongly granular area in anal region encroaches somewhat on the ventral surface; inguinal gland rather indistinct (distinct in paratypes); a parotoid gland above arm is not compact; a tubercle between arm and tympanum.

Color in life. Above dorsal surface light lavender, limited by the dorsolateral fold; the head lighter—the sides darker purplish (in alcohol the color becomes brownish), arms brownish-cream; lower arm and hand lavender, barred with purplish. Legs lavender barred with purplish; ventral surfaces cream with a peppering of pigment forming a very dim reticulation, enclosing rounded areas lacking pigment; lips with darker and lighter, more or less quadrangular spots; a dark bar from nostril, above tympanum and arm, becoming wider on side behind arm.

Measurements in mm. Snout to vent, 15; snout, 2.2; width of head, 5.3; length of head, 5.7; arm, 8; leg, 24; tibia, 7.6; foot, 9.8.

Variation. Most of the structural characters are constant; the skin is very rugose in all and occasionally a dim more or less distinct pattern is formed by the dorsal pustules. Usually two tubercles are present in the posterior part of the interorbital region. The largest specimen is a female and the colors are more intense.

Remarks. Two other forms of the genus occur in this region, *albolabris* and a form related to *hobartsmithi.* Further specimens of the latter will be necessary to determine its exact status. The specimens were all taken on the ground. The call is a weak chirp resembling an insect call more than that of an amphibian. These were heard both morning and late afternoon, as well as at night. I cannot distinguish the calls of the various forms.

Hyla melanomma sp. nov.

(Plate LVIII; figs. 1, 1a, 1b)

Type. EHT-HMS No. 21578; collected 7 miles east of Chilpancingo (Cuidad Bravos), Guerrero, Mexico, August 20, 1939; E. H. Taylor collector.

Paratypes. EHT-HMS Nos. 21545-21554, 21556-21558, 21560-21578; same locality and date; H. M. Smith and E. H. Taylor, collectors.

Diagnosis. A small hyla with a known maximum snout-to-vent length of 32 mm.; interorbital width one and three-fourths to twice the width of an eyelid; canthus rostralis distinct, lores sloping; greatest diameter of tympanum about two-thirds of length of eye; a slight axillary web; vomerine tooth groups lying between the anterior ends of choanae; a very strong tarsal fold; heel brought forward reaches eye.

Description of the type. Head rather broad, with relatively small eyes, the distance between the orbits (4.2 mm.) nearly twice the width of an eyelid (2.15 mm.); length of eye (3.4 mm.) reaching anterior edge of nostril; distance between nostrils equals width of eyelid; snout a rather pointed oval with little or no depression between nostrils; canthus distinct, but slightly rounded; lores sloping; the eyes seen from above extending beyond profile of jaw; tympanum distinct, the upper edge overhung by a slightly developed fold; tip of snout extending about 1.4 mm. beyond lower jaw; tongue about as wide as long, not or but very slightly notched behind, and with a very narrow free posterior edge; vomerine teeth in two transverse groups of six teeth, the anterior edges of the raised area extending slightly anterior to a line drawn between the anterior edges of the choanae; latter moderately large, oval.

Hand with rather large disks which are distinctly smaller than tympanum; outer digits half webbed or slightly less; first finger narrowed behind the disk; distal subarticular tubercles large, well-defined, that of outer finger single; proximal digits small; palmar tubercles tripartite, that on base of first finger elongate, not strongly differentiated; numerous indistinct tubercles or granules on palm; a row of tubercles under forearm; hind limbs relatively short, the tibiotarsal articulation reaching middle of eye; the heels overlap when limbs are folded at right angles to body; toes more than three-fourths webbed, the membrane reaching to near the disks; toe disks smaller than those on outer fingers; outer metatarsal tubercle large, distinct, rather diagonal in position; outer tubercle small, less distinct; a very strong tarsal fold extends to heel, running slightly diagonally; anal flap short, rather narrow, with a slight median groove below it; skin on dorsal surfaces smooth; chin, throat and breast with dim, flattened granules; venter, sides and under side of femur strongly granular; a slight elevation behind eyes; axillary web distinct but small.

Color in life. Above, light olive green, lighter on side and above limbs; below flesh white; when preserved, the color is light flesh with a fine peppering of pigment some of which segregates to make minute flecks; a fine, equally distributed peppering of pigment on limbs, on both dorsal and posterior faces, visible under a lens; the eyeball is very black and seen through the eyelid make the eyelid appear black; a slightly darker area or spot between eyes.

Measurements. Snout to vent, 31.2 mm.; length of snout, 5.1 mm.; snout to arm, 11 mm.; width of head, 11 mm.; length of head, 10.6 mm.; arm, 16.4 mm.; leg, 46 mm.; tibia, 15.5 mm.; foot, 20.8 mm.

Variation. Of the five adult paratypes three were colored like the type; two were purplish above save in the rump region, with a darker area on the tip of the snout; the darker area between the eyes is more pronounced in most of the specimens and there is slightly more pigment at the tip of the snout; some of the specimens have a slight depression between the nostrils; the smallest specimen measures 30 mm.; the largest, 32 mm.; the proportional measurements are very close to those of the type. All are females.

The young specimens taken at the same time differ from the adults in the shape of the head, the snout being shorter, and the tympanum is concealed. In life they vary from olive to leaf green, while some showed a purplish coloration above.

Remarks. All the specimens were taken from bromelias in the low trees growing along a small stream. The green and olive coloration matched the green shades of the outer sides of the bromelias, while the purplish markings were similar to the purplish coloration of the inner basal parts of the leaves. Whether the males have vocal sacs or nuptial callosities is not known. I do not find sacs present in any of the young, all of which are recently transformed. This is not conclusive evidence that this character is absent.

I am uncertain as to the relationship of this form. Two other Mexican Hylas are known to live in the bromelias—*Hyla bromeliana* and *Hyla arborscandens.* The latter differs in being a very much larger frog with yellow lateral spots; it has a sharper canthus rostralis and strongly defined nuptial callosities with minute nuptial spines on first and second fingers. From *Hyla bromeliana* it differs in having much smaller eyes, a wider interorbital region, and in the absence of the characteristic bands on the limbs.

Hyla arborescandens Taylor

Hyla arborescandens Taylor, Univ. Kansas Sci. Bull., vol. 25, July 10, 1938, pp. 388-391, fig. 1 (type locality 3 km. southwest of Acultzingo, Veracruz).

The type locality of this species was revisited on August 19 and 20, 1939, and a series of specimens were obtained from bromelias. The males agree with the type in having a rather sharp snout. The inner edge of the second finger has a row of minute spinules running to near the terminal pad, and occasionally spinules occur on the inner edge of the third finger. This character was overlooked in the type. The characteristic marking of the hind limbs is present in all the specimens, but more distinct in some than in others. The fold which runs from the eye, above the tympanum, terminates above the arm in a parotoid gland; a more or less distinct fold follows the parotoid and this may be thickened and glandular; the interorbital distance is much larger than the width of the eyelid.

The two females in the lot are distinctly larger than males and both are filled with nearly ripe eggs. In one the color was dark olive to olive-brown above, with small, indistinct, darker areas above; and three or four yellowish spots along the sides; the other was light olive with a large quadrangular black spot on neck, with fine darker flecks scattered on back and dorsal surfaces of limbs. The snout is not pointed but somewhat truncate, and the lower jaw is more rounded, and the nostrils are almost directly above edges of lip. The yellow spots on the sides are replaced with a fine, rather indistinct reticulation.

Whether the eggs are laid in the bromelias or not I cannot say, but it is probable that they are. The breeding season would appear to be much later than that of *Hyla miotympanum*. Many of the tadpoles of the latter had already transformed at this time. In the numerous plants examined, no eggs or tadpoles were found. The snout to vent measurement of the largest male was 38 mm.; of the largest female, 49 mm.

Hyla erythromma Taylor

Hyla erythromma Taylor, Proc. Biol. Soc. Wash., vol. 50, April 21, 1937, pp. 48-50, pl. 2, fig. 1 (type locality, Agua del Obispo, Guerrero).

This species, discovered in 1936, was described from a single female specimen. With the hope of obtaining more specimens in order to establish its legitimacy on a firmer basis, Dr. Hobart M. Smith and I revisited the spot where I had obtained the type. At a point about 200 meters from here in a rivulet arising from the Agua del

Obispo spring I found six specimens of a small frog in a bush overhanging the rivulet. They were calling, but the low voices could be heard at a distance of only a few meters. Doctor Smith obtained one in a tree some thirty meters farther up the stream.

On examination all of the specimens proved to be males and all had an extraordinary lateral gland extending nearly the distance between axilla and groin and reaching below like two closely pressed flaps on the abdomen. All had brownish-red eyes.

A comparison of these specimens with the type of *erythromma* leads me to the belief that they are the males of that species despite the differences that obtain. There is no evidence of the gland in the type. The skin is very smooth, while in the male specimens the skin is distinctly corrugated; the webbing between the digits is very slightly more extensive in the males; the lateral markings are more distinct and they are much more heavily pigmented above; the ventral part of the glands are yellowish with more or less dark pigment. The entire ventral part of the abdomen of the female is lacking in pigment and it is entirely covered with large granules instead of only the area between the glands as in the males.

In life the males were largely green, or olive of varying shades. Certain of the specimens showed a brownish reticulation or mottling on the olive. The sides were cream, with spots, blotches or mottling of brown or olive. A diagonal cream stripe was present on the base of upper arm, while the axilla was cream. Below, the belly was creamy white to yellowish-cream. Some specimens had a few brownish spots on chin or throat and in front of the insertion of the arm.

That I am dealing here with two species is not beyond possibility. However, only larger series can settle the point beyond doubt. The small *Hyla pinorum* Taylor, also taken in this immediate locality in 1936, was not rediscovered, but there is no possibility of these specimens belonging to that species.

The first finger has a wider base than in the type and its dorsal surface is beset with a group of twenty to thirty black, horny spines, very much larger and not closely approximated as in such forms as *Hyla lafrentzi, arborescandens* and *bistincta.*

Hyla forbesi sp. nov.

(Plate LVIII; figs. 1, 1a 1b)

Type. EHT-HMS, No. 22276; collected on a mountain three miles southwest of Acultzingo, Veracruz, August 27, 1939, by Dyfrig McH. Forbes.

Diagnosis. A medium-sized hyla (known snout to vent length, 45 mm.) with very large, salient eyes, the eyelid wider than interorbital distance; tympanum concealed under skin, faintly indicated, measuring about one-third of eye length, its surface directed upward; canthus sharp; an arched glandular fold is continuous with the fluted anal flap; a small web between fingers; toes about three-fourths webbed; no outer metatarsal tubercle; tarsal fold low, indistinct; vomerine tooth group large, between small choanae which are partially concealed by a palatal ridge; a pectoral fold; chin and breast lacking granules; abdomen strongly granular.

Description of the type. Female with abdomen distended with eggs. Head moderate, narrower than the distended body; eyes very large, very strongly salient, seen from above they extend strongly beyond profile of jaws; eye as long as snout (5 mm.); nostrils nearly terminal, the snout projecting about 1.4 mm. beyond mouth; canthus rostralis sharp; projected lines of canthi intersecting on the tip of the snout; width of an eyelid (4 mm.) greater than the interorbital width (3.65 mm.); distance between nares 3.2 mm.; region about angle of mouth projects somewhat from side of head so that the tympanic region is almost entirely visible from above; tympanum covered with skin, its outline dimly visible, its diameter (1.6 mm.) about one-third of the length of the exposed part of eye ball; lores almost vertical.

Tongue very wide, circular, papillate, definitely nicked posteriorly, free for one-third of its length; choanae small, each with an anterior ridge which partially conceals the opening; vomerine teeth bordering the posterior edge of a raised region which is three times the size of the visible choanal opening; these areas lie between the choanae and extend anteriorly to their anterior level, and posteriorly to their posterior level.

Skin above smooth (under the lens only very faint corrugation is discernible); edge of eyelid somewhat thickened; a well-defined supratympanic fold from eye to above arm; neck constricted behind angle of jaws; sides with indistinct flattened granules; granules on chin wanting; a pectoral fold present; abdomen strongly granular;

ventral surface of femur and the lower part of its posterior face granulate, the granules becoming larger and reaching higher below anus; anal flap fluted, continuous with an arched glandular fold. Skin on limbs smooth; hand with a small but distinct web, the edges of web continued on fingers as narrow fringes; terminal pads large, the diameter of that on outer finger about 3 mm. wide; subarticular tubercles large, rounded, that on outer finger not bifid; a large palmar tubercle, more or less divided, the anterior part largest and rounded; a dim row of tubercles on underside of forearm and scattered supernumerary tubercles on hand; tibiotarsal articulation reaching anterior edge of eye; foot about three-fourths webbed; subarticular tubercles well-developed; numerous supernumerary tubercles which extend also onto sole; inner metatarsal tubercle rather large, with a small adjoined tubercle on its inner border; outer tubercle apparently wanting; tarsal fold dim, with indication of small pustules.

Color. Top and sides of head and anterior part of body, blackish-gray; posterior part of back shows very small, indistinct spots darker than the general color; dorsal surface of arms and fingers uniform dark; of legs and toes, mottled blackish-gray; belly and concealed surfaces of arms and legs, whitish; chin heavily pigmented with blackish-gray; under surface of knee dark; sides cream, with some dark reticulations and spots; undersurfaces of hands and feet more or less pigmented, posterior surface of thigh cream, strongly flecked and reticulated with darker color.

Measurements in mm. Snout to vent, 45; tip of snout to eye, 6.5; width of head, 14; length of head, 12; arm, 30; leg, 71; tibia, 22.5; foot, 33.5.

Remarks. Lacking knowledge of the characters of the males as pertains to the presence or absence of vocal sacs, and the nuptial armature of the first finger, I find it difficult to determine the relationship of the species. The presence of the arched anal fold is unique; the upturned face of the tympanic region (which does not appear to be due to distortion) is unusual. The size of the vomerine tooth areas is larger proportionally than in other known Mexican species.

In the type locality, *Hyla arborescandens* and *Hyla miotympanum* also occur. From the former it may be distinguished by the narrower interorbital distance, the larger eye and the smaller tympanum which is partly concealed. *Hyla miotympanum* differs from it in having a broadly rounded and flattened snout, the nostrils not

terminal; the lores are not vertical and the canthus rostralis is broadly rounded. The color in life was probably some shade of dark green above.

I take pleasure in naming the species for its discoverer, Mr. Dyfrig McHattie Forbes, of Potrero Viejo, Veracruz, my host on numerous occasions, who is an ardent collector and enthusiastic student of Mexican herpetology.

HYPOPACHUS Keferstein

Hypopachus Keferstein, Nachricht ges. Gottingen, 1867, p. 351 (type species, *Hypopachus seebachii* Keferstein = *Engystoma variolosum* Cope); Parker, A Monograph of the Frogs of the family Microhylidae 1934, p. 110. (See this paper for more complete synonymy.)

Parker's monograph recognizes five forms of this genus, as follows: (1) *Hypopachus incrassatus* Cope (Paraguay, S. E. Bolivia, S. W. and N. W. Brazil; (2) *H. inguinalis* Cope (Guatemala); (3) *H. variolosus* (Cope) (Costa Rica); (4) *H. cuneus* Cope (Texas); (5) *H. oxyrhinus* Boulenger (Sinaloa, Jalisco, and Michoacán in Mexico; Guatemala). Since its publication, *H. parkeri* Wettstein has been described from Brazil; *H. barberi* Schmidt and *H. globulosus* Schmidt from Guatemala.

Description. "Prevomer divided, the postchoanal portion absent; palatine absent. Clavicles and procoracoids present, almost straight, reaching the midline of the girdle and the scapulae; omosternum absent; sternum cartilaginous. Vetebral column diplasiocoelous. Terminal phalanges simple."

"Pupil round or rhomboidal. Tongue large, oval, entire and half free behind. Two smooth dermal ridges across the palate in front of the pharynx, the anterior much shorter than the posterior. Digits not dilated. In all the known species the tympanum is hidden, the first finger shorter than the second and the third toe longer than the fifth." (From Parker *loc. cit.*)

Kellogg, 1932, treating of the Mexican species of the genus, gives only *Hypopachus variolosus* (Cope). He places *H. oxyrhinus* Boulenger as a synonym of *variolosus*.

He lists the type of *H. oxyrhinus* in the British Museum; three specimens in the U. S. National Museum from Guadalajara and one from Arriba, Costa Rica (the latter probably properly associated with *H. variolosus*) and one from Ocatlan, Jalisco, in the American Museum of Natural History. While recognizing *H. cuneus* Cope as a legitimate species, he had seen no Mexican specimens of that species.

Parker, 1934, records *H. oxyrhinus* as follows: The cotypes (2) from Presidio de Mazatlán, Sinaloa; 1 specimen, San Salvador,

Michoacán, 2,500 ft.; 1 specimen, Buena Vista, Michoacán, 2,000 ft.; 1 specimen, Cofradia, Michoacán, 700 ft. He lists a half-grown specimen in the Mus. Vienna, from Coban, Vera Paz, Guatemala.

The material on which the present report is based consists of more than 250 specimens of the genus and 6 species and subspecies are recognized. The localities are scattered widely in the Republic. No specimens are known from the northern or eastern two-thirds of the plateau. On the plateau it is confined to the southwestern region. It occurs in lowlands everywhere except to the northwest, in northern Sinaloa and Sonora. The genus is unknown in Baja California.

Groups of specimens from Chapala, and Zapotiltic Jalisco; and Queseria, Colima; offer certain problems, and require further study. A part of these from the west coast belong to *H. oxyrhinus* Boulenger. I wish to acknowledge the aid of Mr. H. W. Parker of the British Museum for his kindness in examining specimens.

Hypopachus cuneus cuneus Cope

(Plate LXII, fig. A; Plate LXIII, figs. 7, 7a)

Hypopachus cuneus Cope, U. S. Nat. Mus. Bull., No. 34 1889, pp. 388-389, fig. 98 (type description; type locality "San Diego in Nueces County," Texas).

This species, originally discovered on the extreme northern border of its known range, has been traced some distance into the eastern coastal region of Mexico. The following specimens are present in the collection: EHT-HMS Nos. 1094-1097, near Forlon, Tamaulipas, Mexico, August 4, 1934; H. M. Smith-David Dunkle collectors. These are the first recorded specimens from Mexico. Aside from the Mexican specimens the following Texas specimens have been available: EHT-HMS Nos. 1032-1033, 13 mi. S. E. Rio Grande City, Texas, September 6, 1932, Taylor and Smith; K. U. Nos. 9886-9891, San Diego, Duval county, Texas, July 3, 1930, Taylor; K. U. No. 9885, Cameron county, Texas, July 3, 1930, Taylor.

This subspecies is distinguished by the almost complete loss of the digital web on foot in both sexes; relatively shorter legs; small hands and feet; absence of any clearly defined reticular pattern on the ventral surface.

Tongue free for about half its length. Anterior dermal ridge (fold) slightly curved; posterior ridge followed by parallel dermal folds running longitudinally; on each side laterally, in older specimens, these folds may begin on a level with the posterior edge of the anterior ridge; choanae large, when seen from ventral view,

nearly two-thirds of the openings concealed by an overhanging shelf. Male with vocal sac.

The coloration of the Mexican specimens is an indefinite olive. The pattern on the back consists of an inverted V, on the shoulders; the two sides of the latter then continue back parallel for a short distance then diverge to the groin. This figure is outlined with a series of more or less distinct, irregular black dots or spots; a row of similar spots begins behind eye and continues to groin. The area between this and the median pattern is a trifle lighter than color within the figure. The groin has one or two irregular ocellated darker spots which may extend on the proximal dorsal and anterior face of femur as a continuous or broken stripe; femur, tibia and foot each with bands or dots of black which tend to form a continu-

Measurements in mm. of *Hypopachus cuneus cuneus* Cope

Museum	KU	EHT-HMS	EHT-HMS	EHT-HMS	EHT-HMS	EHT-HMS	EHT HMS
Number	9890	1032	1096	1095	1094	9885	1097
Sex	♀	♂	♂	♀	♀	♂	♀
Snout to vent	40.0	39.?	38.5	35.3	34.5	34.0	33.0
Snout to occipital fold	6.2	5.6	5.1	5.1	5.0	5.2	0.0
Head width at groove across jaws	12.0	11.0	9.2	9.7	9.4	9.8	8.6
Eye length	4.2	3.6	3.5	3.4	3.35	3.5	3.2
Eye to tip of snout	4.2	3.5	3.5	3.4	3.35	3.5	3.1
Length of snout	3.2	3.0	2.5	2.56	2.3	2.?	2.3
Snout beyond mouth	1.7	1.9	1.9	1.7	1.8	2.0	1.9
Eye to nostril	2.6	1.9	1.9	1.6	1.7	2.0	1.9
Width of eyelid	3.0	2.4	2.1	2.0	2.0	2.5	2.0
Interorbital width	4.1	3.7	3.2	3.6	3.6	3.6	3.3
First finger	2.5	2.2	2.3	2.5	2.4	2.8	2.3
Second finger	5.0	3.8	3.3	3.2	3.2	4.2	3.5
Third finger	7.0	6.4	5.5	7.1	5.25	5.8	5.4
Fourth finger	3.6	3.0	3.0	2.9	2.7	2.7	3.0
Hand and longest finger	11.45	11.1	9.4	10.2	9.7	10.0	9.2
Arm	22.6	20.0	19.0	21.9	18.9	19.8	19.0
Leg	46.2	46.0	43.2	46.0	41.2	43.0	42.3
Foot from heel	20.8	20.3	19.2	21.0	19.0	19.2	19.3
Femur	14.2	14.3	13.0	13.5	12.2	12.2	12.2
Tibia	12.0	12.1	12.0	12.0	10.2	12.0	11.6
Axilla to groin	23.0	20.0	18.2	16.0	15.0	17.3	14.0
Heels separated when folded	1.5	1.5	1.3	1.8	1.5	1.5	1.4

ous pattern when the limb is folded; the space between the bands reddish or yellowish tan.

No. 1094 has a very fine light tan reticulum scarcely discernible on ventral surface. The chin is powdered with cinnamon.

No. 1097 is yellowish-white with no trace of markings; arm with traces of bands. The hair fine median line is present; in all there is also a trace of a median line on chin and throat, and one beginning above anus follows an irregular course back of the femur and tibia on the heel. One specimen from Brownsville and one from San Diego shows more lateral spotting which encroaches somewhat on the abdomen; light line behind and below eye not black bordered

Hypopachus cuneus nigroreticulatus subsp. nov.

(Plate LIX)

Type. EHT-HMS, No. 12605, adult female, Encarnación, Campeche, Mexico; collected by Hobart M. Smith, October 1, 1936.

Paratypes. EHT-HMS, Nos. 12594-12604, 12612, 12614-12655, Encarnación, Campeche, October 1-10, 1936; 12656-12674, 12675-12690, Encarnación, Campeche, October 11-14, 1936; 12606-16611, Tres Brazos, Campeche, September 19, 1936; 12691, Pital, Campeche, October 16, 1931; 12613 Chichen Itzá, Yucatán, August 25, 1936—all collected by Hobart M. Smith.

Diagnosis. Related to *Hypopachus cuneus cuneus,* but differs in having the markings on the throat of a different character from those on abdomen; a heavy black reticulation covering abdominal region and underside of limbs; sides of body black with yellow spots or reticulations; dorsal surface of upper arm light, usually cream color and dorsal part of femur with a light ground color, cream or pinkish cream in life.

Description of the type. Snout narrow, pointed, its anterior outline oval when seen from above; canthal region rounded, the sides of the snout slightly oblique, with a very slight depression in loreal region; snout projects beyond the mouth nearly half its length; eye large, 4 mm. in length; length of snout, 2.3 mm.; eye to tip of snout, 3.9 mm.; eyelid, 2.1 mm.; interorbital width, 4 mm.; snout to occipital fold, 5.6 mm.; tongue broad, rounded behind, free for more than half its length. Palatal ridges distinct, the anterior shorter than posterior, slightly curved; second higher, broader, transversely longer than the preceding ridge; behind the second the derm is arranged in longitudinal, plicate folds, which at sides push forward along the end of the second ridge; choanae large, but when viewed

directly from below the overhanging ridge conceals three-fourths of the openings; openings of the Eustacian tubes half as large as choanae, placed opposite the posterior edge of the first dermal ridge; fold across the occiput moderately distinct; fold across chin well defined; fold on breast not distinguishable; a thickened fold from eye to arm, bordered by a deep groove; this groove is intersected by the one from the chin fold, which crosses the jaw angle at a point some distance behind the eye.

Arm moderately long, brought forward, the hand extends beyond the snout; three well-developed palmar tubercles, the median extending more forward than other two, outer largest, inner smallest; second and fourth fingers extend an equal distance forward, reaching the anterior edge of the distal subarticular tubercle of the third finger; first finger reaches only as far forward as the proximal tubercle of the third finger.

Leg brought forward the inner metatarsal tubercle reaches at least to the posterior corner of eye; when legs are folded at right angles to the body the heels are separated by five millimeters; outer metatarsal tubercle more than half as large as inner, narrowly separated from inner; latter with its greatest length distinctly less than length of the first toe, compressed, strongly elevated; outer tubercle much less elevated; no web between digits (a trace only in males).

Color. Above nearly uniform lavender-brown, slightly more olive in dorsolateral region; the dorsal pattern obsolete, evidenced only by an H-shaped group of black dots above shoulders; a hair-fine line from tip of snout to above anus; a dark stripe from tip of snout to groin, broken more or less on sides; area on side of head below eye slightly pigmented and a white or cream stripe present from eye to insertion of arm; dorsal face of limbs light, remainder with dark spots, stripes or reticulations; a group of spots on posterior part of back and inguinal region; a rather large black inguinal spot; bars on dorsal surface of legs represented by small black spots; under surface of feet, except tips of toes, dark; chin dull lavender with a very fine lighter reticulation; belly cream with a heavy black reticulation; a hair-fine line from tip of chin to breast, and from its posterior end two broader cream lines run forward to arm insertions.

Variations. Most of the differences observable are those due to age. One or two very young specimens have the ventral reticulation dim; in some specimens the typical (generic) dorsal pattern is rather clearly defined and is outlined with darker. The dorsal ground color varies through grays, gray-browns, lavenders, to reddish purple; the

ventral color is whitish to cream; the ventral reticulation varies from dark gray to deep black. The single specimen from Chichen Itzá, Yucatán, has the dorsal surface an immaculate, dark lavender with a single groin spot; no dorsal limb markings; throat deep lavender with fine lighter flecking; and the ventral reticulation of the abdomen is very dim. Males have a vocal sac, and have small tubercles scattered on dorsal surface of body and limbs; tubercles also present on chin and on lateral edges of digits.

Measurements in mm. Snout to vent, 43.4; snout length, 2,3; head width, 13; head length, 11.3; arm, 23.1; leg, 49; tibia, 16; foot, 22.8.

Remarks. It is a surprising fact that more than ninety-five percent of this large series of specimens are females; in the other species of *Hypopachus,* I have from Mexico, the males strongly predominate.

Hypopachus ovis sp. nov.

(Plate LXII; fig. B)

Type. EHT-HMS No. 1050, adult male, collected at Tepic, Nayarit, Mexico, July 31, 1934, by E. H. Taylor.

Paratypes. EHT-HMS Nos. 1034-1049, 1051-1093, topotypes; same data.

Diagnosis. A small species, known maximum size 36.5 mm., with a dorsal pattern clearly defined; sides dark with small cream spots; limb brought forward the inner metatarsal tubercle fails to reach eye; males with toes one-fourth to one-fifth webbed, the web continued as a slight fringe on side of digits; width of eyelid about half of interorbital distance; snout projects but little beyond mouth; skin above roughly corrugated; males with fine, pearly tubercles on dorsal and lateral surfaces, posterior face of leg, on chin and lateral digital fringes. Venter grayish with dim, lighter spots.

Description of the type. Snout narrow, pointed, projecting somewhat beyond the mouth; canthal region rounded, lores oblique, with a distinct depression between nostril and lower part of eye; line of mouth does not reach as far posteriorly as the back of eye; snout projects beyond mouth scarcely more than one-third its length; eye, 3.5 mm. long; snout, 2.9 mm.; eye to tip of snout, 3.1 mm.; eyelid, 2 mm. wide; interorbital width, 3.5 mm.; snout to occipital fold, 5 mm.; tongue elongate, free for half its length; anterior dermal ridge on palate separated from posterior by 1.4 mm.; posterior ridge wider and transversely longer, followed by longitudinal plicae which push up farther forward at ends of ridge; openings of eustachian tubes round, about one-half the area of the choanae, which are elongate and when viewed from below, are nearly half concealed by the over-

hanging shelf; openings of eustachian tubes are opposite the space between dermal ridges; a strong dermal fold passes across head and down to about lower level of eye then passes back to near insertion of arm, the skin of the fold being much thickened laterally and preceded by a groove; a vertical groove crosses near angle of jaws, but cannot be traced across chin; no chinfold and no fold across breast. Skin of breast and anterior abdominal region thickened, into an abdominal glandular area (not so in females); skin of the dorsal surface strongly rugose, the summits of the small pustules each surmounted by a pearly tubercle on all dorsal surfaces, very few on head; a few tubercles on chin and along the lateral edges of digits; arm moderate, brought forward the hand extends beyond the snout; three palmar callosities, the two outer largest, the median extending more forward than other two; fourth finger extends slightly farther forward than the second, neither extends beyond the distal tubercles of the third finger; inner metatarsal tubercles fail to reach eye when leg is brought forward; metatarsal tubercles more or less compressed, the length of the inner distinctly less than distance between tubercle and end of first toe, longer than free part of first toe; toes one-fifth to one-fourth webbed in males (less in females), the web continued as a narrow fringe for some distance along the sides of the digits, the edge surmounted by a row of spinelike tubercles.

Coloration. Above brown with a median darker pattern edged with black, beginning between eyes and extending back in a symmetrical pattern to posterior end of body; sides lavender-brown, darker than adjoining region of the back, with small cream flecks; lower on sides, larger, rounding, cream spots; femur and tibia crossed by a black-edged stripe, continuous when leg is folded; arm with some darker areas and a light area on the dorsal surface of upper arm; chin grayish-black (males); abdomen, breast, and under side of limbs with a reticulum of lavender pigment enclosing lighter areas so sparse that the abdomen appears nearly white; posterior face of femur and tibia, brown with cream spots; under surface of hands and feet lavender, except tips of digits and the metatarsal tubercles which are cream.

Variation. The large series is uniform in most structural characters and in size. There are slight differences in proportion as shown in the table of measurements.

Remarks. The series was obtained at night in the environs of Tepic in a small pasture. Most of the specimens were calling from tiny puddles of water that had formed in hoofprints.

Measurements of *Hypopachus ovis*, sp. nov.

Museum	EHT-HMS	EHT-HMS	EHT-HMS	EHT-HMS	EHT-HMS	EHT-HMS	EHT-HMS	EHT-HMS
Number	1057	1075	1059	1071	1073	1044	1070	1050
Sex	♂	♂	♀	♂	♂	♂	♀	♂
Snout to vent	36.5	36.5	36.0	35.5	35.0	34.5	31.0	35.0
Snout to occipital fold	5.3	5.7	5.6	5.0	5.3	5.0	5.0	5.0
Head width at groove across jaw	10.0	10.7	10.7	10.4	10.2	10.0	9.6	10.2
Eye length	3.6	3.8	3.8	3.5	3.8	3.6	3.2	3.5
Eye to tip of snout	3.1	3.5	3.3	3.3	3 1	3.0	3.0	3.1
Length of snout	3.0	2.6	3.0	3.0	2.7	2.8	2.5	2.9
Snout beyond mouth	1.4	1.5	1.5	1.4	1.6	1.4	1.4	1.0
Eye to nostril	1.6	1.6	1.9	2.0	1.7	1.9	1.6	2.0
Width of eyelid	1.9	2.0	1.9	1.7	1.9	1.8	2.0	2.0
Interorbital width	3.9	4.0	3.8	3.6	3.9	4.0	4.3	3.5
First finger	2.5	2.8	2.8	2.8	2.6	2.9	2.4	2.5
Second finger	2.9	3.3	3.6	3.75	3.1	3.4	3.1	3.1
Third finger	5.3	5.4	5.8	5.5	5.3	6.0	5.2	5.3
Fourth finger	3.1	3.1	3.1	3.0	3.2	3.5	3.0	3.1
Hand and longest finger	9.2	9.4	10.3	10.0	9.5	9.9	8.7	8.9
Arm	21.0	19.0	20.3	20.0	21.0	19.2	18.5	20.0
Leg	39.8	42.0	42.2	39.0	40.3	41.0	38.3	39.0
Foot	16.2	18.3	18.0	18.5	19.0	19.0	17.0	0.0
Femur	11.7	11.3	12.5	10.7	11.0	10.0	11.2	0.0
Axilla to groin	18.0	18.0	18.0	19.0	20.0	20.0	14.0	0.0
Tibia	11.3	12.4	11.6	10.0	11.0	12.0	9.8	0.0
Heels separated when folded	3.0	3.0	2.3	2.0	3.0	2.7	2.0	0.0

Hypopachus alboventer sp. nov.

(Plates LX, LXIII; figs. 3, 3a)

Type. EHT-HMS No. 18615; eight miles east of Cuernavaca, Mor. June 20, 1938. E. H. Taylor coll.

Paratypes. EHT-HMS Nos. 6552-6555, km. 133, near Huajintlán Mor. July 14, 1936; 18611-18614; 18616-18621, two to eight miles north and east of Cuernavaca, June 17-20, 1938. E. H. Taylor.

Diagnosis. A medium sized species, maximum known length 44 mm. (♀); males with a well-defined glandular region on breast extending onto abdominal region, the posterior border definite; absent in females; toes nearly half webbed, in males the membranes somewhat excised, the toes bordered almost to tip with dermal fringes;

female with toes about one-fourth webbed; length of inner tubercle four-fifths of the inner toe; venter cream white without reticulation or ocelli; dorsal pattern somewhat similar to *H. ovis*, but lacking ventral markings with more web on feet in males. Limb brought forward, tibiotarsal articulation reaches about to arm insertion, the inner metatarsal tubercle fails to reach eye.

Description of type. Snout narrow, short, truncate, extending beyond line of mouth, the nostrils almost terminal; loreal region sloping vertically; canthus rostralis indistinct rounding; length of eye (3.1 mm.) minutely longer than snout; diameter of nostril large contained in its distance from eye about two and one-half times; width of an eyelid (2.3 mm.) less than half of the interorbital width (4.8 mm.); no trace of tympanum; a strong fold from corner of eye to arm; another fold passes across jaw angle and across the throat; line of mouth does not reach back as far as posterior corner of eye.

Tongue elongate, free for half its length, nearly as wide posteriorly as anteriorly; anterior palatal ridge distinct, separated from the larger posterior ridge by a distance equal to half its length; posterior ridge higher, prominent, followed by regular plicae; choanae large, at anterior end of buccal cavity, concealed almost completely by upper jaw when seen from below; hand with large subarticular tubercles; three palmar tubercles, that on base of first finger smallest, median largest, placed farther forward than other two. Legs short, the tibiotarsal articulation reaches to near arm insertion; when folded at right angles to body, heels separated by from four to five millimeters; toes about one-third webbed; the dermal fringes on toes narrow, inconspicuous; subarticular tubercles rather small; no supernumerary tubercles; inner metatarsal tubercle very large, strongly salient, the inner free edge somewhat compressed, the outline seen in profile forms a half circle; outer metatarsal tubercle smaller, its free edge pointing anteriorly, a little more than half size of inner and separated from it by a space less than half its length.

Skin thick rugose; the pustules, small, distinct rather flattened on back and sides, arms smooth; proximal part of the posterior face of femur with fine pearly spines; a few on dorsal surface of tibia; ventral face of femur with a few, large, flattened granules; a slight fold behind eyes; head quite smooth; anterior face of femur and tibia smooth.

Color. Deep purplish lavender above with a black edged, darker area extending from behind eyes to back of body, widening gradually, the outer edges irregular; the black border of this area crosses

the limbs, making a continuous line when limbs are folded; an inconspicuous inguinal, dark spot; chin and throat with a heavy peppering of lavender-brown pigment; belly rather cream with a fine peppering of pigment discernible under a lens; tips of digits and the tubercles pure cream; heel, soles and palms purplish; posterior face of femur lavender with some blackish reticulation; a very tiny white line on fold back of mouth angle.

Measurements of type and paratype (No. 18619 ♂) in mm. Snout to vent, 44, 37.8; snout length, 4, 3.2; width of head, 13.8, 13.4; length of head, 9.8, 10; arm, 26.5, 22.5; leg, 50, 46; tibia, 15.8, 15.2; foot, 25.2, 24.

Variation. The type series is constant for the general structural characters; the dorsal marking may be more distinct than type or almost obsolete; males differ in having a fairly well-defined thickened glandular area on breast which exudes a viscous fluid that dries into a rubberlike sheet. It probably serves to assist the male in clasping the female. The feet of the males have much more webbing and the dermal fringes are usually distinct to the narrow tips of the toes. The edges of the digits are beset with minute spinules of pearl color; a few scattered spinules on back, sides and venter; those on posterior face of femur are absent; most of the specimens have a deep purplish spot back of eye; the chin is bluish black in males. The call is a rather high pitched bleat that is from two to two and a half seconds in duration.

Remarks. This form may be separated from its congeners by the greater webbing on the feet and absence of a reticulated or ocellated pattern on venter. Specimens were obtained at night. Their call suggests the call of a small lamb or kid. Often they would call from the edges of pools where they had burrowed into the earth leaving only small openings to the outside.

Hypopachus maculatus sp. nov.

(Plate LXII, figs. E, F; Plate LXIII, figs. 2, 2a)

Type. EHT-HMS No. 1023; near San Ricardo, Chiapas, Mexico, September 2, 1935; E. H. Taylor and Hobart M. Smith colls.

Paratypes. EHT-HMS Nos. 1016-1022; Asunción, Chiapas, Mexico, September 1, 1935, Hobart M. Smith and E. H. Taylor.

Diagnosis. Related to *alboventer* but differs in having the sides and posterior part of body spotted with black; a fine median dorsal line; a diagonal cream line behind the eye; body more elongate in proportion to width; eye larger in proportion to length of snout.

Toes of males nearly one-third webbed; venter cream-white unspotted. Known maximum size, 41 mm. ♀.

Description of the type. Adult female; head width (11.6 mm.) greater than length, (9.2 mm.); very heavy fold across head behind eye, continued to arm; a groove crosses jaw angle and passes across the throat; eye length (4 mm.) greater than length of snout (2.9 mm.); width of an eyelid (2.2 mm.) slightly more than half the interorbital width (4.1 mm.); choanae very large, not more than half concealed by jaws when seen from below; tongue without pigment (true also of *alboventer*). Anterior dermal palatal ridge twice as long as its distance from the posterior; latter ridge followed by dermal plicae; which also reach forward on each side of the ridge; (vocal sacs in males).

Three palmar tubercles, the median largest extending forward beyond other two; subarticular tubercles large; no supernumerary tubercles. When leg is brought forward the inner metatarsal tubercle reaches anterior corner of eye.

Toes less than one-fifth webbed, the web continued on sides of toes as narrow dermal fringes (nearly one-third webbed in males); inner metatarsal tubercle with a compressed edge, the outline not semicircular, its greatest length a little longer than its distance to tip of inner toe; outer metatarsal tubercle about half size of inner.

Skin with small pustules, not strongly defined (more so in some paratypes); a few indistinct granules on posterior part of femurs; male with minute spinules on pustules, on toe edges and on chin.

Color. Above purplish brown with an irregular row of spots from eye along side to groin; some scattered darker areas on back, numerous spots on lumbar region and groin; a double, black line crosses femur and tibia; arm faun with some small black spots; dorsal part of femur faun; tibia lavender; posterior face of femur faun, heavily spotted with black; below uniform cream (males with black throat); lip light lavender; a cream line from eye to foreleg.

Remarks. The series of measurements given of the type series, show the variations in proportions; the photographs of the two paratypes give the variations in markings.

The specimens were collected while Doctor Smith and I were enroute to Tuxla Guterriez, from Tonolá. About nightfall we arrived at a small stream near Asunción, and finding it flooded, we were forced to spend the night at that place. We utilized the delay to good advantage obtaining the types of this species and good series of several other species during the night.

Measurements of *Hypopachus maculatus* sp. nov.

Museum	EHT-HMS	EHT-HMS	EHT-HMS	EHT-HMS	EHT-HMS	EHT-HMS	EHT-HMS
Number	1023	1016	1021	1017	1019	1018	1022
Sex	♀	♂	♂	♂	♂	♂	♀
Snout to vent	41.0	37.2	35.5	35.0	34.2	34.0	29.0
Snout to occipital fold	6.1	6.0	5.9	5.5	5.3	5.1	4.6
Head width at groove across jaws	11.6	11.0	11.1	11.5	11.2	10.1	7.4
Eye length	4.0	3.8	3.7	3.5	3.35	3.5	3.2
Eye to tip of snout	3.5	3.6	3.7	3.6	3.6	3.6	3.3
Length of snout	2.9	3.0	3.0	2.3	2.3	2.9	2.3
Snout extends beyond mouth	1.3	1.9	1.8	1.3	1.3	1.4	1.5
Eye to nostril	2.1	2.0	2.0	2.0	2.1	2.0	1.7
Width of eyelid	2.2	2.0	2.0	1.75	1.8	1.9	1.7
Interorbital width	4.1	3.9	3.55	3.6	3.9	3.3	3.1
First finger	3.3	3.0	3.0	3.2	3.4	3.0	2.4
Second finger	4.2	3.3	3.8	3.8	4.1	3.6	3.0
Third finger	7.0	6.3	6.6	7.0	6.9	6.3	5.3
Fourth finger	3.9	3.6	3.0	3.2	4.0	3.7	2.9
Hand and longest finger	11.4	10.3	11.0	11.4	11.0	10.8	8.0
Arm	24.8	22.0	21.8	23.3	21.5	21.3	19.6
Leg	52.0	47.0	46.0	45.0	47.0	47.0	31.0
Foot	21.8	22.0	21.3	20.0	22.0	21.5	15.2
Femur	16.2	14.5	13.0	13.0	13.0	14.2	8.2
Tibia	14.2	12.0	12.0	13.1	13.1	12.0	8.1
Axilla to groin	19.0	20.0	18.2	19.0	17.2	17.8	15.0
Heels separated when folded	4.3	4.0	3.1	2.8	3.8	3.4	2.0

Hypopachus caprimimus sp. nov.

(Plate LXI; Plate LXIII, figs. 1, 1a)

Type. EHT-HMS 18149, Agua del Obispo, Guerrero, in pine forest; June 25, 1938. Taylor, coll.

Paratypes. EHT-HMS, Nos. 1024-1026, Balsas river at Mexcala; 1027, Garrapata; 1028, Organos; 1029-1030, Mazatlán, near Chilpancingo; 6556-6559, 18145-18148, 18150, 18159, Agua del Obispo, near Rincón; 18142-18144, near Palo Blanco; 18151-18153, Buena Vista; 18154, 18158, El Limoncito, near La Venta; all localities in the state of Guerrero. Taylor, coll.

Diagnosis. A large species, the known maximum size (♀) 51 mm. Related to *oxyrhinus,* but differs in a broader head; eye longer than the snout (equal or less in *oxyrhinus*); and a broad, dark purplish or

blackish stripe from snout to groin, continued on front of femur. It differs from other forms in having the tongue pigmented, often forming blackish areas or spots; toes one-fourth (or a little less) webbed; a dark inguinal spot; venter cream with a deep, black-brown reticulation.

Description of the type. Width of head (14 mm.) much greater than length (9.2 mm.); eye (4 mm.) longer than snout (2.5 mm.); width of an eyelid (2.4 mm.) less than half the interorbital distance (4.1 mm.); distance between eye and nostril (2 mm.) greater than distince between nostril and snout tip (1.2 mm.); a fold back of eyes crossing head and continuing back on side of neck to arm insertion; a fold passing across angle of jaw and throat; angle of mouth not extending back as far as eye; no trace of tympanum; tongue elongate thick anteriorly, thin behind, feebly nicked posteriorly, free for nearly half its length; pigment on tongue forming a large dim, median area, terminating in two spots posteriorly; choanae large, not more than half concealed by overhanging shelf from upper jaw; anterior palatal ridge distinct, slightly curved; posterior ridge higher, thicker, followed by plicate folds; openings of the vocal sacs very distinct; arms rather long, the wrist reaching beyond snout; first finger shorter than second; latter about equal to fourth; three palmar tubercles, the median rather small (in paratypes, larger than outer) and extending farther forward; edge of fingers with minute, pearly spinules (wanting in females); leg short, the heels separated (by 6 mm.) when limbs are folded at right angles to body, heel reaches to a point above arm, and the anterior edge of inner metatarsal tubercle reaches to nostril; toes about one-fourth webbed, the web continued somewhat as narrow dermal fringes; inner metatarsal tubercle very large, its length minutely less than that of first toe, its free outline forming a half circle; outer tubercle more than half the size of inner, both tubercles compressed and with a free edge; skin above minutely corrugated, without pustules or granules; very slight evidence of granulation on sides; a few flattened, indistinct tubercles below anus.

Color. Above lavender-brown, with an irregular series of streaks and small spots of black forming diagonal line which connects with a black inguinal spot; and which, when limb is folded, crosses femur, tibia and foot as a broad, blackish band with a light line or spots within its borders; a broad, black stripe from snout to groin and along front face of femur, the upper edge clearly defined by a lighter border; upper arm cream above, dark anteriorly and pos-

teriorly; forearm and hand spotted with purplish or black. Venter bright cream, with a heavy, dark reticulation. Palms and soles purplish, the tubercles cream; posterior face of femur black with some lighter spots.

Measurements in mm. of type and large female (No. 18159). Snout to vent, 42.5, 51; length of snout, 2.5, 3.4; eye, 4, 4.5; width of head, 14, 14.8, length of head, 9.2, 10.3; arm, 26, 30.5; leg, 51.8, 58.5; tibia, 16, 18; foot, 28, 29.5.

Remarks. The diagnostic characters given separate this species from other recognized species. The variation in shade of dorsal coloration is great, ranging from a clay color and light brown to purplish and from lavender to deep red. The call is a sustained bleat.

Microhyla elegans (Boulenger)

Engystoma elegans Boulenger, Catalogue of the Batrachia Salientia s. Ecaudata in the collection of the British Museum, 2d Ed. 1882, p. 162 Type description; type locality "Cordoba," Veracruz, Mexico.

Gastrophryne elegans Kellogg, Bull. U. S. Nat. Mus., No. 160, p. 183, 187.

Microhyla elegans Parker, A monograph of the frogs of the family Microhylidae, London, 1934, p. 126,144.

A single female specimen, EHT-HMS, No. 12692 ♀ was collected by Doctor Smith in Tres Brazos, Campeche, September 19, 1936. Its size suggests a young animal as its snout to vent measurement is only about one-half that of the largest known specimen.

Head rather pointed, strongly projecting (1.1 mm.) beyond mouth; eye (1.6 mm.) in length of snout (2.1 mm.) 1.3 times; eye to tip of snout, 2.5 mm. (in the type, the snout is twice the diameter of the eye); canthal region rounded, very slightly concave in front of eye; a strong skin fold across head behind the eyes, which passes down on side and is dimly traceable back toward the insertion of the front leg, and from eye back it is bordered by a groove; a groove crosses posterior part of jaws and is visible on sides of chin; nostril much nearer tip of snout than eye; width of an upper eyelid (1 mm.) in interorbital distance, 2.3 times. Tongue large, free behind for nearly half its length; anterior dermal ridge slightly curved, separated laterally from raised, rounded areas by a narrow distance; second ridge transverse, crenulate, behind which the derm is arranged in parallel longitudinal folds; openings of the Eustachian tubes opposite the raised rounded areas, small, about one-third the diameter of a choana; latter large, when observed from a ventral view, more than two-thirds of the opening is concealed by an overhanging shelf. (Males with a vocal sac.) Pupil of eye round.

Limbs well-developed, the arm reaches beyond the snout; the

hind leg brought forward along the sides of the body, the tibiotarsal articulation reaches eye, the metatarsal tubercle reaches the tip of snout; three flat, palmar tubercles on hand, the median extends farther forward than the other two; fourth finger a little longer than second, reaching the second outer subarticular tubercle; first finger short, reaching anterior edge of the subarticular tubercle of the second, tubercles only slightly raised. A slight, indistinct, inner metatarsal tubercle; first toe reaches posterior edge of tubercle on second toe; second toe reaches to anterior end of the proximal tubercle of third toe; third toe to the distal tubercle of fourth; fifth toe slender small, failing to reach the medial tubercle of fourth toe; apparently no trace of web (a rudiment in males); when limbs are bent at right angles to body, the heels touch.

Color and markings. Brownish lavender above; a stripe on side of snout, and from behind eye, continues dimly to groin; an inguinal black spot. A single, broad, black-edged stripe crosses femur, tibia and heel. A triangular dark spot involves anus; an hourglass-shaped dark spot begins near eyes and disappears near middle of back; chin with a fine distribution of pigment enclosing small irregular cream spots; belly cream or whitish, with a more or less regular reticulum of dark pigment; a few darker spots on knees; undersurface of hands and feet pigmented, including tubercles; a light spot on tip of snout.

Measurements in mm. Snout to vent, 18; to arm, 7; axilla to groin, 8.5; tip of snout to fold of head, 3.3; width of head to groove on jaw, 5.1; arm, 9.8; leg from anus, 26.5; femur, 8; tibia, 8; foot from heel, 13.

Remarks. This small species remains rare in collections. There are three, including the type from Veracruz in the British Museum, and a single specimen in the University of Michigan collected in Guatemala.

Microhyla olivacea (Hallowell)

Engystoma olivaceum Hallowell, Proc. Acad. Nat. Sci. Philadelphia, 1856 (1857), p. 252 (type description; type locality probably Kansas, although not specifically stated).
Gastrophyrne olivacea Smith, Copeia, 1933, No. 4, p. 217. (Kansas, Oklahoma.)
Microhyla olivacea Parker, Monograph of the Microhylidae, 1934, pp. 148, 201.

This species is represented in the collection by a considerable number of specimens as follows: EHT-HMS Nos. 1193-1196, two to three miles east of Torreón, Coah., Mex., August 29, 1932, E. H. Taylor-H. M. Smith colls.; Nos. 1226-1235, five miles north of Conejos, Durango, Mexico, June 25, 1934, H. M. Smith and David

Dunkle; No. 1197, Zapata, Texas, U. S. A., September 3, 1932, Taylor and Smith; Nos. 1198-1218, 13 mi. S. E. Rio Grande City, Texas (Arroyo El Salado), September 6, 1932, Taylor & Smith; Nos. 1219-1225, 3 mi. S. E. Rio Grande City, September 3, 1932, Arroyo Los Olmos, Taylor and Smith.

A few slight differences are in evidence between northern (Kansas) specimens and southern (Mexican) forms, but these differences seem to break down where large series are available. I can see no constant differences between Texas specimens and those from Coahuila and Durango.

Description of species. From EHT-HMS No. 1194, Torreón, Coah., adult female. Head triangular; general habitus very stout (female with eggs); eye small (2.4 mm.), shorter than snout (2.9 mm.); distance of eye from anterior tip of snout, 3.2 mm.; eye to nostril, 1.9 mm.; eyelid (1.3 mm.) contained in interorbital width (3 mm.) 2.3 times; snout to occipital fold 4.7 mm.; snout extends beyond mouth 1.5 mm.; snout rounded, the canthus not distinct; lores oblique with only a slightly concave region. The anterior dermal fold on palate shorter than posterior and separated by a distance about equal to the width of the anterior; openings of the eustachian tubes small, less than a fifth as large as the very large choanae; a line drawn between the openings of the eutachian tubes passes anterior to the anterior dermal fold; more than half of choanae visible when viewed directly from below; tongue large, rounded a little in front, flattened behind, free for a little less than half its length.

Skin smooth save for numerous tubercles on posterior face of femora on either side of anal region; a curving fold crosses the head and runs back to arm, the fold thickened laterally; a groove crossing the angle of the jaw can be traced a short distance on chin.

Arm brought forward the hand extends beyond snout; palmar tubercles large, flat; fourth finger longer than second; subarticular tubercles large rounded; leg brought forward, the inner metatarsal tubercle does not reach eye; when legs are folded at right angles the heels touch (or sometimes slightly overlap); inner metatarsal tubercle relatively small, its length contained about twice in its distance from the tip of the first toe; toes not or but slightly flattened, no lateral fringe or only a faint trace of a dermal fringe on toes; male with a vocal sac.

Color. Above olive-brown in alcohol, usually more olive in life; a few very small, darker, rounded spots on dorsal surface; the dor-

sal pattern, as such, is wanting; a few dark flecks arranged in an irregular row behind eye, and one between eyes; below immaculate; very slight pigmentation under chin, some on under side of the feet and hands, not visible save under a lens.

Variation. Males differ from females in having small pearl-colored tubercles scattered on the back, eyelid, dorsal surface of tibia-fibula, dorsal and posterior part of foot, on edges of fingers and a semicircular patch around the edge of lower jaw; occasionally a few scattered ones back of the femur near anus—but never as numerous or as prominent here as in females.

In color the markings vary from nearly uniform olive specimens to specimens with still more numerous black spots than in the described specimens. The colors range from gray to brown. One or two specimens have a median dorsal dark pattern, bordered by the darker spots. Males have a dark infusion on the chin, due to the pigmentation of the vocal sac lining. In specimens of equal head-body length there is some variation in size of foot and also slight variation in the relative lengths of the fingers and toes. The largest male specimen (No. 1234) from Conejos, Durango, has somewhat more pigment on throat and breast and on the underside of hands and feet; the toes seem slightly flattened and there is a faint indication of a web. Since the lining of the mouth is somewhat loose the relation of the openings of the eustachian tubes and the dermal folds varies somewhat.

Remarks. These specimens extend the known range into the states of Coahuila and Durango, a distance of about three hundred miles.

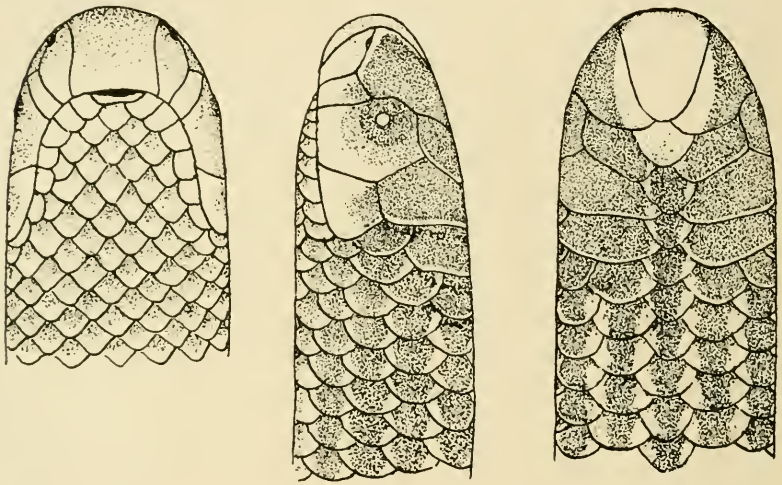
Aside from the specimens already listed I am associating with this species three specimens which may be specifically distinct from this form. I collected the specimens, Nos. 1236 ♀, 1238 ♀, and 1237 ♂, at Mazatlán, Sinaloa, July 20, 1934, at an elevation less than ten meters above sea level. The specimens are dark brown, with an irregular, more or less continuous dark line beginning a little behind eye and continuing along the side for some distance beyond arm. Anal region of female less papillate; eye a little smaller and snout narrower and extending a little more beyond the mouth than in equal-sized specimens from Durango and Texas.

The three specimens are small and indifferently preserved. I have hesitated to describe the form as new without a more adequate series of specimens. The largest specimen, a female, measures 25 mm. snout to vent, but is adult containing eggs; the largest male measures 23 mm.

Leptotyphlops magnamaculata sp. nov.

Type. U. S. N. M. No. 54760, Utilla Id., Honduras., F. J. Dyer, collector. (The specimen is a female containing two eggs.)

Diagnosis. A small, lined species (length, 167 mm.) with a large cream spot involving much of rostral, edges of nasals and the prefrontal. Rostral but little less than half width of head, supraoculars present, two labials; scales 14 rows; 233 dorsal scales; terminal scale wedge-shaped.



TEXT FIG. 1. *Leptotyphlops magnamaculata* sp. nov. Type. USNM, No. 54760; Utilla Island, Honduras. (× 11.)

Description of the type. Rostral large, a little less than half width of snout, slightly narrowed between nostrils, extending back between eyes but not reaching their posterior level; nasals separated by the prefrontal, which is much smaller than the supraoculars; latter widely separated from first labial, reaching to very near edge of eye above; anterior parietal very broad, in contact with second (last) labial; posterior parietal (occipital) wide, slightly narrower than the preceding, separated from the second labial by a single scale; nasal completely divided, the superior nasal wider and longer than inferior nasal, considerably narrower than the rostral at its widest point; first labial small, not reaching as high as the inferior nasal, reaching as high as eye but not level of pupil; the labial border of first labial larger than that of inferior nasal; eye very large, raised slightly, pupil distinct; the labial border of ocular slightly less than second labial; ocular slightly narrower than the

rostral; four lower labials, last largest, completely concealed when jaw is closed; six scales, as well as the median mental, which is grooved but not divided, border upper labials when mouth is closed; scales from rostral to tail spine about 233; scales under tail, 17; head scales with minute rugosities; if epidermis is shed, these appear as pits on scales.

Color. Color above, deep, dark brown, forming continuous lines; below only slightly lighter brown, the edges of all scale rows lined with creamy white. The four dorsal light lines are widest and run from head to near tip of tail, each occupying space on edges of two scale rows; the line between the fifth and sixth rows is almost obsolete and the brown coloration here forms a band nearly two scales wide; the lines between the fifth and fourth and the fourth and third scale rows are more pronounced than the preceding and are somewhat zig-zag; lines between third and second, second and first are less contrasted. Head brown, with a prominent cream spot on snout covering rostral, prefrontal (internasal) and parts of the upper nasals. The lower part of ocular and the posterior upper labial have an irregular cream area. Ventral edges of the rostral, nasal and first labial, as well as the lower labials and chin are light with more or less pigmentation. Tip of tail including about four transverse scale rows, clear cream.

Measurements. Total length, 167 mm.; tail, 10.4 mm.; width of head, 2.5 mm.; width of body, 3.7 mm.; tail length in total length, 16.7 times; diameter of body in total length, about 45 times.

Remarks. This species, related to *phenops,* is differentiated by the size of the frontal cream spot and the lower number of ventrals; the body is apparently wider in proportion to length and the rostral is wider, and the terminal spine is somewhat vertically wedge-shaped.

I presume it is a derivative of *phenops* that has differentiated in an island habitat.

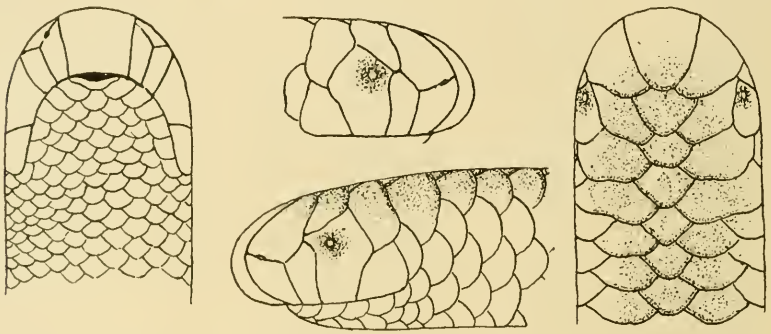
Leptotyphlops rufidorsum sp. nov.

Type. U. S. N. M. No. 49993, Lima, Peru. Townsend, collector.

Diagnosis. A large (265 mm.) species lacking white or yellow spots on snout and tip of tail, and lacking lineated dorsal markings. Supraocular very large, in contact with (or narrowly separated from) first labial. Two labials. Total dorsal scales, 268; 14 scale rows. Tail in body length, 22 times; body width in length about 61 times.

Description of the type. Rostral broad, (1.85 mm.) slightly less than one-half width of head (3.85 mm.), somewhat tongue- shaped,

the sides widening slightly near the tip of snout, then gradually narrowing to a blunt, rounding tip, behind, broadly in contact with the internasal (prefrontal) and separated from the supraoculars; prefrontal large, wider than long, smaller than the supraoculars; latter elongate, diagonal, in contact with the first labial at about level of eye pupil on right side (on left narrowly separated; [abnormally?]). Nasal completely divided, the widest point on the nasals about equal to greatest width of the ocular; latter irregular in shape, bordering the lip to a slightly lesser extent than the second (last) labial; anterior parietal larger than the posterior, broadly in contact with the second labial, from which the second



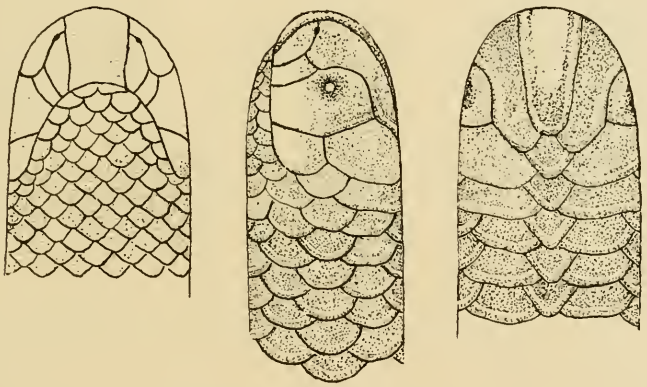
TEXT FIG. 2. *Leptotyphlops rufidorsum* sp. nov. Type. USNM, No. 49993; Lima, Peru. (×8.)

parietal is separated by a single scale; frontal smaller than either prefrontal or interparietal; median scales following the interparietal smaller than adjoining scales; four lower labials, the fourth largest and completely concealed; when mouth is closed, six scales appear to border the upper labials, the last three separated from the labial border by the fourth labial. Scales in fourteen rows anterior to anus; on tail ten rows. Anal large; first subcaudal much wider than succeeding scales. Total dorsal scales from rostral to tail spine, 268; subcaudals 17.

Color in alcohol. The three median dorsal scale rows and the adjoining half rows on each side reddish-brown with only slight indication of darker centers; remaining rows creamy white; the spine is distinctly darker than remainder of tail (perhaps nearly black in life).

Measurements in mm. Total length, 265; tail, 12; width of head, 3.85; width of body, 4.3.

Remarks. The relationship of this species with other South American forms is a bit uncertain. It is widely separated from *albifrons* by absence of lineated pattern, terminal yellow spots and about 78 more transverse scale rows; from *goudotii* in having the nasal completely divided; from *affinis* by having the first labial relatively narrow and in contact with the supraocular; from *bilineata, macrolepis, myopica* and *bressoni* by having only two labial scales; from *humilis, dugesii* and *septemstriata* in having supraoculars; from *bakewelli* and *phenops* in the type of color and markings and absence of contact between labial and supraocular; from *dimidiata* it differs in having a large supraocular touching the labial; the tail is contained in total length 22 instead of 14 times; from *maximus* and *dulcis* by the very large supraocular and higher number of scales; from *borrichiana* in having the supraocular touching the first labial.



TEXT FIG. 3. *Leptotyphlops nasalis* sp. nov. Type. USNM. No. 16134; Managua, Nicaragua. (× 12).

Leptotyphlops nasalis sp. nov.

Type. U. S. N. M. No. 16134, Managua, Nicaragua.

Diagnosis. A form lacking supraoculars, their space occupied by the superior nasal rather than by the oculars; no prefrontal; fourteen scale rows. Rostral elongate, reaching behind posterior level of the eye; two labials present; dorsal scales, 253; tail, in total length, 14.6 mm.; diameter of body in total length, 55 times.

Description of the type. Rostral but little more than one-third width of head, tongue-shaped, narrowed a little between the nostrils, extending back considerably behind posterior level of eye, in contact with the frontal; nasal divided completely, the superior nasal greatly

elongated, extending farther back than the rostral; superior nasal somewhat narrower than the rostral, slightly narrower than the ocular; anterior parietal very large, broadly in contact with the last (second) labial; second parietal (occipital) narrower, separated from the last labial by a single scale; only first pair touches the frontal, which is as large as the interparietal; prefrontal wanting; first labial narrow, reaching to lower level of eye but not as high as the pupil, separated from the second labial by the ocular. The labial border of the inferior nasal less than that of the first labial; labial border of ocular much larger than that of preceding scales but less than that of the second labial; four lower labials, the outer largest, concealed (when mouth is closed, six scales border the upper lips); eye distinct, rather large, more than half the width of an ocular; eye and pupil distinct; about 253 scales from rostral to terminal caudal spine; 21 scales under tail; 14 scales around body; 10 scales around tail.

Measurements. Snout to vent, 110 mm.; tail, 7.5 mm.; diameter of body, 2 mm.; tail in total length, 14.6 mm.; diameter in length, 55 times.

Color in alcohol. Above light brown, the color lighter on the ventral surface (may be discolored somewhat by preservation); a small cream spot on rostral beginning near anterior end of snout, but not reaching anterior level of eye. On the tail the spine alone is cream.

In the dorsal coloration there is some slight segregation of the pigment but trace of the lineation such as is present in *bakewelli* or *phenops* is wanting.

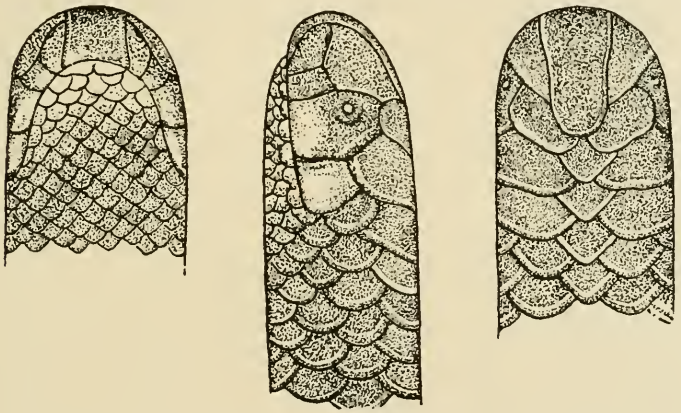
Remarks. The curious elongation of the nasals, the absence of supraoculars and a prefrontal, easily distinguish this species from any of the other known species.

Leptotyphlops ater sp. nov.

Type. U. S. N. M. No. 79957, Managua, Nicaragua, H. C. Kellers, collector.

Diagnosis. A medium-sized, heavily pigmented species, showing no trace of dorsal lineation; large supraoculars present, widely separated from the labial, broadly in contact with the rostral; two labials; eye moderately distinct, rostral lacking trace of terminal cream spot; terminal spine cream; fourteen scale rows; tail in total length, about 18.9 times; width of body in total length, about 60 times; 259 scales snout to vent.

Description of the type. Snout rather truncate anteriorly; rostral somewhat less than one-half width of head at widest point, the part above rather tongue-shaped, extending distinctly behind the posterior level of the eye, broadly in contact with the supraoculars; prefrontal absent; frontal small, equal to interparietal, a little more than half the size of the supraoculars; anterior parietal large, wider than posterior parietals, broadly in contact with the last (second) labial; the posterior parietal separated from labial by a single scale; nasal completely divided, the lower part small, much narrower than upper part; first labial barely reaching lower level of the eye which is moderately distinct; part of rostral on under side of snout slightly



TEXT FIG. 4. *Leptotyphlops ater* sp. nov. Type. USNM, No. 79947; Managua, Nicaragua. (×9).

narrower near the nostrils; the labial border of the ocular a little larger than that of last labial; the labial border of first labial small, about equal to that of the inferior nasal; three lower labials on right, four on left side; six scales border the upper labials when the mouth is closed.

All the head scales have tiny rugosities which appear as pits when epidermis is removed; scales in 14 rows to anus; 10 about tail; 259 dorsal scales between rostral and terminal spine; anal large, single; 17 subcaudals, the three rows under tail much widened; eye large, moderately distinct.

Color in alcohol. Blackish-brown to blackish above; ventral surfaces a lighter brown, the terminal spine cream; scales bordering mouth whitish, showing some unpigmented areas.

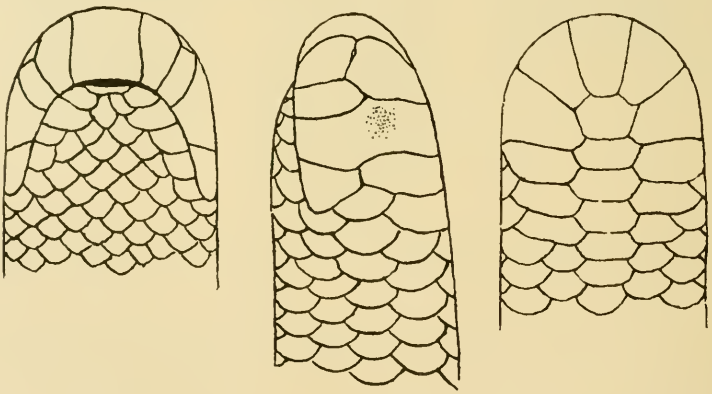
Measurements. Total length, 185 mm.; tail, 9.8 mm.; width of body, 305 mm.; width of head, 2 mm.

Remarks. This species is possible related to *bakewelli,* despite the fact that it lacks a rostral cream spot and lineated markings on body. The relation of the frontal and the supraoculars are similar in the two species; the other Central American species having an elongate rostral (*Leptotyphlops nasalis*) lacks *the supraoculars* and the space occupied by the supraoculars is occupied by the superior nasals. This species lacks the lineated markings.

Leptotyphlops dugesii (Bocourt)

Siagonodon dugesii Bocourt, Etude sur les reptiles, Mission Scientifique au Mexique et dans l'Amérique Central, Livr. 8, 1882, pp. 507, 508, pl. XXIX, fig. 9, 9a, 9b, 9c; and pl. XXX, fig. 4 (type description; type locality, Colima, Mexico, A. Dugès collector).

This species has remained very rare in collections. Three specimens in the U. S. National Museum belong to this form: No. 26140 "Mexico," A. Dugès; No. 48537, Guanajuato, A. Dugès; No. 49632 Talpa, Jalisco, Nelson and Goldman. The last specimen has been badly dried and broken. The others are in a fair state of preservation, save that they are badly faded.



TEXT FIG. 5. *Leptotyphlops dugesii* Bocourt. USNM, No. 26140; "Mexico." (×7).

The relationship of this form is probably with *Leptotyphlops humilis* (Baird and Girard), but I am not prepared to admit that the relation is subspecific. The total count of scales from rostral to terminal plate is 231 and 244 in the specimens mentioned above; there are 18 scales under the tail. In both cases the anal is entire (divided in one of the two cotypes). The head is more truncate than in *humilis* and the median scales following the rostral have straight transverse edges. The prefrontal is much larger in *dugesii.*

The coloration of the U. S. N. M. specimen is badly faded. Bocourt says of the types, "Une teint d'um jaune roussâtre, légèrement carminé, est répandue sur toutes les régions supérieures du corps. Les parties inférieures sont d'un jaune rosé."

Characters of the scales are indicated in the figure.

SYNOPSIS OF AMERICAN LEPTOTYPHLOPIDAE

1. Snout with a sharp transverse edge 2
   Snout rounded in profile, no sharp transverse edge 3
2. Snout hooked; supraoculars present; total length, 180 mm.; tail in total length, about 26 times; diameter of body in total length, 50 times; pale brown above, white below. Type locality, Cruz de Eje, Argentina ..... *unguirostris* (Boulenger),
   Snout not hooked; supraoculars absent; total length, 185 mm.; tail in total length, 28; diameter of body in total length, 61; 5 dorsal scale rows light brown, borders lighter; white ventrally and laterally. T. 1., Santa Rosa, Mendoza, Argentina, *borrichiana* (Degerbol),
3. Four upper labials; ocular not bordering mouth; 110 mm.; tail in total length, 14 times; body diameter in total length, 36 times; yellowish, each dorsal scale with a large, reddish-brown spot; yellowish dorsolateral line. T. 1., Martinique, Lesser Antilles ..... *bilineata* (Schlegel),
   Less than four upper labials 4
4. Three upper labials; supraoculars present 5
   Two upper labials 7
5. Anterior parietal touches third (last) labial 6
   Anterior parietal separated from third labial by a postocular scale; 240 dorsal scales; 265 mm.; tail in total length, 19.6 times; diameter in total length 53; purplish on 7 dorsal rows; dirty white below, with a lavender spot on each scale. T. 1., El Sabino, Uruapan, Michoacán, Mexico ..... *bressoni* Taylor,
6. Second labial reaches level of eye; 208 mm.; tail length in total length, (16)-20; diameter of body in total length, 39-50; dorsal scales, 233-246; 7 dorsal scale rows brownish or faun; below white. T. 1., Tampico, Mexico. Range, northern Mexico, Arizona to Kansas ..... *myopica* (Garman),
   Second labial does not reach eye; 290 mm.; tail in total length, 14-15; diameter in total length, 41; dark brown above, each scale with a lighter border; lighter beneath. T. 1., "Caracas; Puerto Cabello." Range, Venezuela, *macrolepis* (Peters),
7. Supraoculars absent 8
   Supraoculars present 13
8. Nasal not reaching posterior level of eye 9
   Nasals elongate, reaching back beyond posterior level of eye; cream spot on rostral; rostral reaches to behind eyes; total dorsal scales, 253; total length, 110 mm.; tail in total length, 146; diameter in total length, 55. T. 1., Managua, Nicaragua, *nasalis* sp. nov., 535
9. Seven dark or black dorsal lines on a yellowish ground; no terminal spine; 220 body scales; about 10 on tail; 280 mm.; tail in total length, 28; diameter in length, 45. Known from Rio Negro, Amazonas, Brazil ... *septem-striata* (Schlegel),
   No dorsal lines 10
10. Average dorsal scale count above 260 11
    Average dorsal scale count less than 260 12
11. Seven dorsal scale rows dark brown; lighter below; dorsal scales 263-281, average, 273; maximum length, 245 mm.; diameter in total length, 47-61; average 53. T. 1., Valliecitas, California ..... *humilis humilis* (Baird and Girard),
    Very light brown; dorsal scales, 279-301; average, 289; diameter in total length, 49-61; average, 54; length, 337 mm. T. 1., Yaqui Well, San Diego county, California. Range, California and Arizona ..... *humilis cahuilae* Klauber,

12. Light brown on 5 scale rows; 244-263 dorsal scales, average 252; diameter in total length, 42-54; average, 46; length, about 300 mm. T. 1., La Paz, Baja California. Range, Cape region, Baja California.....*humilis slevini* Klauber,

Above reddish-yellow; below yellow rose; scales 231-244; under tail, 18; total length, 229 mm.; tail in length, 23; diameter in length, about 52. T. 1., Colima, Mexico, *dugesii* (Bocourt), 538

13. Supraoculars very large, touching or narrowly separated from first labial..... 14

Supraoculars small, widely separated from first labial..... 15

14. Three dorsal scale rows and adjoining half rows chestnut brown, without trace of lines; no spot on snout or tail; white below and laterally; 265 mm.; dorsal scales 268; tail in total length, 22; diameter of body in total length, 61. T. 1., Lima, Peru .....*rufidorsum* sp. nov., 533

Dorsally brown, with distinct light lines bordering edges of scale rows; venter light brown, lighter anteriorly than posteriorly; a cream spot on snout and on tip of tail; 175 mm.; total dorsal scales 218-229; tail in total length, 13-17; diameter of body in length, 39-47. T. 1., Kartabo, British Guiana.....*tenella* Klauber,

15. Body greatly attenuated; dorsal scales above 300; dim lighter lines present on dark-brown color of dorsum; lighter brown below; 188 mm.; tail in body length, 17; diameter of body in total length, 82; scales, 331. T. 1., Gran Tombes, northern Peru .....*subcrotilla* Klauber,

Body not greatly attenuated..... 16

16. First labial very large, its labial border greater than that of ocular; 205 mm.; tail in length, 13; diameter in length, 51; brown above, each scale darker in center; whitish below. T. 1., Tachira, Venezuela.....*affinis* (Boulenger),

First labial small, its labial border much less than that of ocular..... 17

17. Nasal only partially divided*; eye large; 15 scale rows on body, 14 on tail; 145 mm.; tail in total length, 25; diameter in length, 60; blackish, each scale edged with a wide grayish border. T. 1., Magdalena Valley, Columbia, *goudoti* (Duméril and Bibron),

Nasal completely divided..... 18

18. Tail with more than 20 subcaudals; no white lines; no spot on snout or tail; 9 dorsal rows nearly black; ventral color somewhat lighter; 183 mm.; tail in total length, 11.8-14.1; diameter in total length, 54-59; dorsal scales, 255-263. T. 1., Watling Island, Bahama Islands.....*columbi* Klauber,

Tail with less than 20 subcaudal scales..... 19

19. Rostral reaching behind the posterior level of eye; prefrontal absent; supraoculars rather large 20

Rostral not reaching level of eye; prefrontal present..... 21

20. Seven dark-brown stripes on seven dorsal scale rows separated by narrow lighter lines; below whitish; cream spot on rostral and under tail; scales 240-255. T. 1., Paso del Río, Colima. Range, Colima to Guerrero, Tehuántepec (and south ?), *bakewelli* Oliver,

Uniform plumbeous to black above, a little less dark below; no cream spot on rostral; 185 mm.; tail in length, 19; diameter in length, 60; dorsal scales 259. T. 1., Managua, Nicaragua .....*ater* sp. nov., 536

21. Body striped above with seven dark dorsal stripes; supraoculars larger than prefrontal 22

Body lacking stripes; prefrontal present; supraoculars not larger than prefrontal, 23

22. Rostral wide, the cream spot large, extending on adjoining scales; only spine on tail cream; 167 mm.; scales, 233; tail in length, 14; diameter in length, 45. T. 1., Utilla Island, Honduras.....*magnamaculata* sp. nov., 532

Rostral cream spot small; elongate spot under tail large, involving tip; scales, 242-256; average, 247; length, 135 mm.; tail in length, 16; diameter in length, 45. T. 1., Tehuántepec.....*phenops* (Cope),

23. A quadrangular spot on snout; scales bordered with whitish; reddish-brown above; pale below; without distinct lines; spot on tip of tail; 180 mm.; tail in total length, 19; dorsal scales ? T. 1., Environs of Para, Brazil....*albifrons* (Wagler),

No quadrangular spot on snout..... 24

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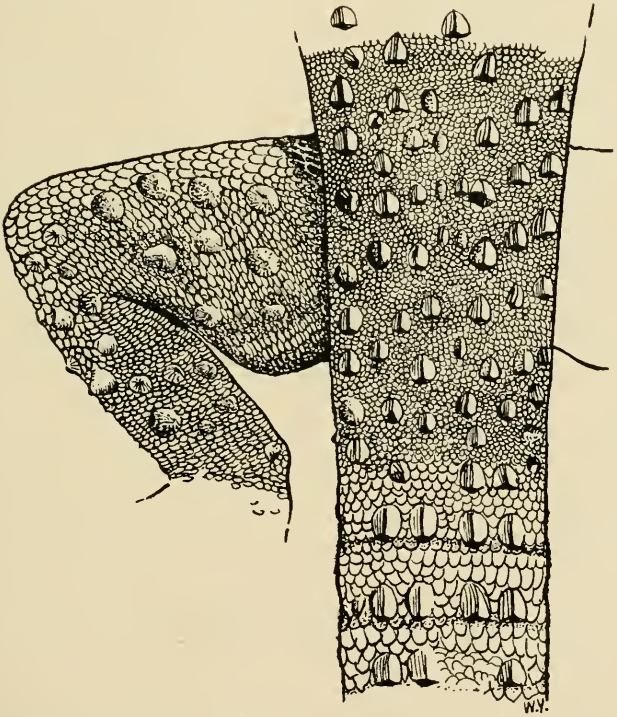
* Boulenger, Cat. Snakes Brit. Mus., vol. 1, 1893, p. 64, states "nasal semidivided; scales in 14 rows."

24. Supraocular smaller than prefrontal, which is longer than wide; rostral reaches level of eye; pale reddish-brown above, scales edged with white; 280 mm.; tail in length, 14; diameter in length, 47. Brazil.....*dimidiata* (Jan),
Supraocular usually larger than prefrontal..... 25
25. Nearly uniform brown above; no spot on rostral or tail; below white; 226 mm.; tail in length, 17.4-22.4; dorsal scales, 231-252. T. 1., between San Pedro and Comanche Springs, Texas .....*dulcis* (Baird and Girard),
Uniform plumbeous above, with white tail tip; below white; 300 mm.; tail in total length, 18-25; diameter in total length, 37-43; dorsal scales, 220-221. T. 1., Chilpancingo, Guerrero, Mexico.....*maxima* Loveridge,

Phyllodactylus lanei Smith

Phyllodactylus lanei Smith, Univ. Kansas, Sci. Bull., XXII, No. 6, April 15, 1935, text fig. 13; Plate XXV, fig. 3, (type description; type locality, near Tierra Colorado, Guerrero Mexico).

Phyllodactylus tuberculosus Mosauer, Copeia No. 3, November 15, 1936, pp. 144-146 (*part.*).



TEXT FIG. 6. *Phyllodactylus lanei* Smith. Showing arrangement of tubercles (granular scales on body are depicted too small). (Much enlarged.)

Certain specimens in the collection referred to *P. lanei* by Smith proved to belong to a different species. Smith (*loc. cit.* p. 128) notes the difference in these specimens from typical *lanei*. The specimens in question are 1181-1183 Organos, Guerrero; 1499-1501

from Agua del Obispo, Guerrero, and 534, 535 and 741 from Mazatlán, Sinaloa.

Smith obtained a series from Hda. El Sabino, Uruapan, Michoacán, which I refer to *P. lanei* (EHT-HMS Nos. 10877, 10943-10994). This lot is especially uniform as regards significant characters. Each of the paired chinshields is in contact with two labials (in 99 out of 102 times). Counts on the number of scales between the middle of the orbits (not at narrowest point between orbits as counted by Smith) showing the following: The number 12 occurs in three specimens; 13 in thirteen specimens; 14 in twenty-three specimens; 15 in fourteen specimens; and 16 in three. Between the orbital edge and edge of eyelid there are usually three rows of granules and the palpebral row bordering the edge. In about 62 percent of the specimens there is an enlarged scute directly above the orbit. In other specimens the scale may be present on one side only or absent on both sides.

I obtained a series of this form in Guerrero in 1936 at the following localities: 11034, 11010, 11014, El Treinte; 10998, 10999, 11001-11006 near Palo Blanco; 11068 Tierra Colorado; 11012-11013 Puerto Crucita, north of Acapulco; in 1938, Nos. 16315-16316, Pie de la Cuesta, and 16317 near Xaltinanguis. These specimens do not show any appreciable departure from limits described by Smith for the species, when the specimens mentioned above are excluded.

Phyllodactylus delcampi Mosauer

Phyllodactylus delcampi Mosauer, Copeia, No. 3, November 15, 1936, pp. 141-144, figs. 1-6 (type locality, Tierra Colorado, Guerrero).

This species may be easily differentiated by the absence of enlarged tubercles on the tail and on the dorsal and posterior surface of the femur; by the large size, with very small dorsal tubercles; and by the transverse dark or black bands on the body. The upper eyelid is apparently more ample than in the other known Mexican species of *Phyllodactylus*, and the pigmentation of the venter is usually somewhat more dense.

Six specimens (EHT-HMS, Nos. 18956-18961) were obtained at the type locality in 1938. Five of these were collected at night and are very much lighter than the types. One, No. 18959, preserved in the daytime is equally as dark as the type. The number of scales between middle of orbits (not counting eyelid scales) is 20-24. Five scale rows form a whorl on tail, the posterior series a little larger usually than the other four. In two cases the postmentals are separated by the mental, in four they are together. In four cases eight

scales follow the postmental, in two five. In two cases the postmentals each touch one labial; in two cases they touch two; in two, on one side, they touch one, while on the other they touch two. Usually there are twelve to fifteen scale rows between the ventral scales and outer row of tubercles. Anteriorly on the body the tubercles are in seven rows on each side, while posteriorly there are five rows on each side.

I have examined the types.

Phyllodactylus homolepidurus Smith

Phyllodactylus homolepidurus Smith, Univ. Kansas Sci. Bull., XXII, No. 6, April 15, 1935, text fig. 1 A and plate XXV, fig. 2 (type description; type locality five miles southwest of Hermosillo, Sonora).

No new specimens of this species have been collected. This form may be distinguished from the southern *P. lanei* by the very small pair of slightly enlarged scales on each tail segment, often so small as to be indistinguishable (as is true in the type); in the large number of scales between orbits (counted between the middle of orbit rather than the narrowest point); in the fact that chinshields usually touch only one labial; in the lack of the enlarged scales on orbital border; in the greatly reduced number and size of enlarged tubercles on dorsal part of the femur or their total absence.

The number of scales between the orbits varies between 19-24, the numbers 20, 21, 22 being equally common, the other counts are represented by one or two examples each; the tubercles on the dorsal part of the body are smaller and less salient than in *P. lanei,* and it is a somewhat smaller species.

From *muralis* it differs in coloration and markings; in having smaller, less conspicuous tubercles on the back; in the greatly reduced number or absence of small tubercles on the dorsal side of the femur. The tail is never so plump, and the scales do not form such distinct regular rows on the tail segments. It is a somewhat larger species.

Phyllodactylus muralis sp. nov.

Type. EHT-HMS No. 10902, near Totolapam, Oaxaca, August 7, 1935; H. M. Smith.

Paratypes. EHT-HMS Nos. 10883-10901, 10993-10939, August 6-7, 1935, Totolapam, Oaxaca, H. M. Smith collector; 11046, San Gerónimo, Oaxaca, August 22, 1935, E. H. Taylor.

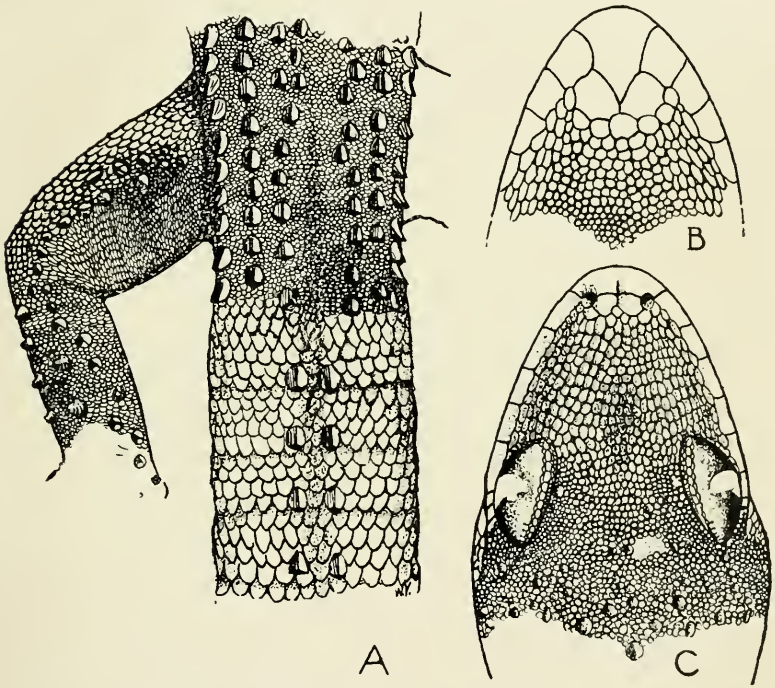
Diagnosis. A rather small species, the postmental normally in contact with the first lower labial only; the scales following the postmentals slightly enlarged, irregular; the flattened scales of the

ventral part of the thigh reach the dorsal surface of thigh where there is usually a row of somewhat enlarged, rather inconspicuous, trihedral scales bordering them; posterior and posterodorsal surface of thigh without enlarged tubercles; dorsal surface of forearm covered with small scales intermixed with numerous, large, trihedral tubercles; 14 rows of large dorsal tubercles, outer rows short; 20-26 scales, average about 24, between middle of eyes (not counting scales on eyelids); 26-33 (average 31) scales in a row across snout between the middle of third labials; enlarged scales on snout extending slightly back of the anterior level of the eyes; very small, rounded or conical tubercles intermingled with small tubercular scales of the occiput; three or four large, closely juxtaposed postanal tubercles; tail slightly constricted at base, covered with transverse rows of small scales, rounded behind; annulations on tail distinctly marked, each annulus consisting of four or five scale rows, the posterior row with two enlarged, median, trihedral tubercles; maximum snout-to-vent length about 60 millimeters.

Description of type. Head moderately flat, somewhat wedge-shaped viewed laterally; a slight constriction in outline of head, as seen from above, just below orbits; a slight frontonasal depression; lores somewhat concave; interorbital scales about 26 between middle of eyes, 14 between anterior corners of orbits (in neither case counting scales on eyelids of which there are three small rows and the larger, irregular, palpebrals which become spinose posteriorly); about twelve scales in loreal region between orbital depression and nostril; scales bordering labials flat, imbricating; about 28 scales across snout between the third labials; rostral twice as wide as high, with a short, median, posterior groove or suture, bordered by a pair of supranasals, the nostril and first labial posteriorly; nostril bordered by rostral, first labial, internasal and two small postnasal scales; five upper labials to a point below middle of eye, diminishing in size posteriorly; here the mouth curves upward and there follow three or four small labial scales, only slightly larger than the surrounding scales; upper labial scales folded around the upper jaw, forming a somewhat flattened platform around edge of snout seen from above; five lower labials to a point slightly beyond middle of eye, anterior three very large, as wide as long, diminishing in size posteriorly; greatest width of mental only a little less than its greatest length, its labial border greater than that of rostral; a pair of large postmental scales, each touching the first labial only; a single enlarged medial scale about one-third size of the postmental follows with three or four other scales likewise

bordering the postmentals, scarcely larger than those of the adjoining row, which is scarcely distinguishable from the rows of scales on throat; scale rows bordering posterior part of jaw larger than scales in middle of chin between them.

A few small, scattered tubercles begin on head between posterior part of eyes and become somewhat larger on occiput; a few or no tubercles in area between lower half of ear and eye; ear opening diagonally placed, its distance from closest point of eye equals



TEXT FIG. 7. *Phyllodactylus muralis* sp. nov. Type. EHT-HMS. No. 10902; Totolapam, Oaxaca, Mexico. (Much enlarged.)

distance from eye to nostril; fourteen rows of trihedral tubercles on body, the two median rows and adjoining rows smallest, the median tubercles separated by about 5 granules anteriorly and by 8 or 10 granules on base of tail; tubercles on sides higher, and wider in proportion to length, than those of the median rows; upper arm with rather large, flat, imbricating scales on upper and anterior face while those behind and below are granular; forearm granular, with enlarged tubercles on upper and posterior sides, while below and on

anterior face the scales are flat, imbricating. Scales on ventral surface of leg large, cycloid, imbricated, covering anterior surface of thigh to its highest dorsal point where the scales are bordered by an irregular row of small trihedral tubercles; posterior face of femur and postero-ventral surface finely granular; upper surface of lower part of leg granular, with enlarged trihedral tubercles; on lower surface scales large, cycloid, imbricating; a ventrolateral fold more or less evident; 30 rows of flat, imbricating scales across abdomen; cloacal lip behind anus barely visible, not forming a posterior scale-like expansion; openings of cloacal pores prominent; 3, 4 prominent tubercles at sides of base of tail; cloacal bone strongly curved as shown in Smith (1935, text fig. B.); the upper tip is more pointed and the posterior part less widened and more rounded; scales under tail irregular, some widened, all much larger than on dorsal surface.

Terminal ventral lamella under fingers and toes longer than wide; the under surface of digits with broad transverse lamella-like scales, the distal one divided, occasionally the two distal; 7, 8, 11, 11, 8 is the lamellar formula for hand (not counting large terminal lamellae); for foot, 7, 10, 12, 11, 12.

Coloration. The specimen is nearly uniform gray without spots or color pattern in evidence; lighter, dirty whitish below.

Measurements (in mm.) and scale data on *Phyllodactylus muralis* sp. nov.

Number	10910	10926	10899	10922	10902
Sex	♀	♀	♀	♀	♂
Snout to vent	60.6	60.3	58.0	56.0	55.2
Snout to orbit	6.7	6.5	6.5	6.2	6.0
Snout to ear	15.4	15.3	15.0	14.2	13.4
Snout to arm	22.9	22.5	22.0	22.0	21.0
Axilla to groin	29.0	29.1	28.0	26.3	28.0
Interorbital width	5.0	5.5	5.2	5.0	4.6
Head length	19.0	18.0	17.0	16.9	16.6
Head width	12.0	12.2	11.0	11.0	11.0
Arm	21.0	20.0	19.2	19.2	18.0
Leg	26.0	24.1	22.4	22.0	22.2
Dorsal rows of tubercles	6-7	7-8	7-7	7-7	7-7
Scales between middle of orbital edges	23.0	25.0	26.0	22.0	25.0
Enlarged cycloid scales across abdomen, max.	28.0	31.0	27.0	26.0	30.0
Scales between fourth labials across snout	21.0	31.0	33.0	27.0	28.0
Scales from orbit to nostril	13.0	12-14	13.0	14.0	16.0

Variation. The normal expectation is for each chinshield to touch one labial only (90 times, one, 23 times, two). Frequently the contact with two labials occurs on one side only. The scales bordering the chinshields are not greatly enlarged; however, there is a single median scale or a pair of median scales that are larger than the rest. The total number varies between six and nine, six occuring three times; seven, seventeen times; eight, thirty-two times; and nine, seven times. The occipital region is covered with granules similar to those on the back, with larger, rounded scales intermingled with them. The tail is constricted, rather distinctly at the base, more so in females than in males. The scales on the dorsal part of the upper arm are cycloid, imbricating, though somewhat thickened, in females; in males the scales are more or less trihedral and raised. The tubercles are very slightly larger in males. A few specimens show dorsal spots arranged in indefinite rows. A more or less definite line extends from the snout to the forearm along the side of the head. The tails are broken in every specimen, suggesting that this member is extremely fragile. The tails at the base are somewhat brownish with indefinite darker spots. In some specimens the pairs of enlarged scales on the tail are less strongly differentiated from the other scales of the tail than in the type.

Remarks. Most of the specimens were taken on walls at twilight and after dark. The specimens of the species are very numerous at Totolapam.

In the reduction of the enlarged scales on the tail and the posterior part of the femur this form approaches *homolepidurus* more than it does *lanei*.

Phyllodactylus magnatuberculatus sp. nov.

Type. EHT-HMS No. 10995, Acapulco, Guerrero, Mexico, October 10, 1936, H. M. Smith.

Diagnosis. Characterized by very large heavy tubercles on dorsal surface in 14 rows, the outer rows smaller; scales between middle of orbits 17; scales of occiput as large generally as those between eyes with slightly larger scales intermingled on the temporal and occipital regions bordering the keeled or trihedral tubercles, all smaller than those on back. Those on nuchal region larger, but likewise smaller than those on back; larger trihedral scales on dorsal surface of femur intermixed with small, unequal-sized granules, the imbricate scales confined to anterior faces of femur; dorsal surface of upper arm with heavy trihedral tubercles placed closely together;

a pair of chinshields broadly in contact with two labials, and in turn bordered behind by four scales, the two median largest forming transverse sutures with the paired chinshields; base of tail with six heavy tubercles on first annules. Scales bordering anterior part of ear cavity, large, triangular, pointed.

Description of the type. Head moderately deep, its greatest length (20 mm.) is 1.5 times the greatest width (13.3 mm.); snout from orbit, 8 mm.; ten large scales between orbit and nostril; twenty-five scales across snout between the fourth labials; scales on snout rather large anteriorly, rounded, low, while in front of orbits, bordering a median elongate depression the scales are compressed conical, or somewhat trihedral; rostral nearly twice as wide as high; a single pair of internasals their suture with rostral, anterior to level of nostrils; nostril surrounded by rostral, first labial, an internasal and two postnasals, the upper largest; eyelid covered with three rows of granular scales and an outer row of superciliaries, anteriorly enlarged, flat, quadrangular, posteriorly strongly spinose; about seven enlarged upper labials, posterior small the suture between the sixth and seventh directly below the vertical pupil; five lower labials to the middle of eye followed by about three slightly enlarged scales; a few enlarged tubercles border the minute labials near angle of mouth. Mental elongate its labial width a little more than four-fifths of its length (3.5 x 4.15 mm.); chinshields in contact for about one-third their length; scales following chinshields are symmetrical forming straight transverse sutures with chinshields, each separated from labial by one scale.

A lateral fold present which is thickened with fatty tissue; granules on back between tubercles much smaller than (one-third) size of scales on occiput; scales on anterior surface of upper arm enlarged and thickened, gradually becoming trihedral or pyramidal on the dorsal surface, with a few small granules between them; forearm granular dorsally with trihedral or pyramidal tubercles; scales on anterior surface of arm larger, imbricating, on ventral surface small granular; scales on ventral surface of abdomen, cycloid, juxtaposed, showing some denticulation on posterior edges; ventral and anterior face of leg with cycloid, imbricating scales; dorsal and posterior face with granular scales; dorsal surface of femur with about 12 large conical or trihedral tubercles; femur and foot (to a lesser extent) with strong trihedral tubercles; terminal lamellae of digits widened and elongated the outer anterior edges angular rather than rounded; a pair of scales at base of the widened terminal

lamellae; under toes and fingers the lamellae may be single or paired, sometimes divided in three; claws retractile in a sheath above terminal lamellae; reproduced tail broken, but the basal segment has three heavy tubercles on each side of the first annulus.

Color in alcohol. Above yellowish-gray with a scattering of pigment; a few elongate dim spots visible along the back near median line; below immaculate yellow (under strong lens some pigment can be discerned).

Measurements in mm. Snout to vent, 66; snout to ear, 17.3; snout to arm, 26.5; axilla to groin, 30; arm, 20; leg, 24; head length, 20; head width, 13.3.

Relationship. The closest relationship appears to be with *Phyllodactylus lanei* from which it differs chiefly in the larger tuberculation of the back, the heavier tubercles of the upper arm, proportionally thicker head and the yellow coloration.

PLATE LIII

FIG. 1. Bufo *mazatlanensis* sp. nov. Type. EHT-HMS, No. 374; Mazatlán, Sinaloa. Enlarged.

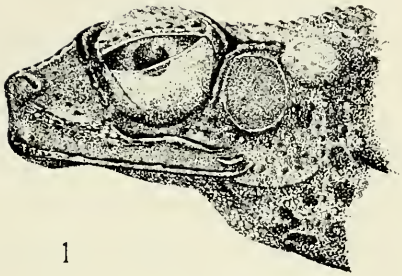
FIG. 2. *Bufo valliceps* Wiegmann. EHT-HMS, No. 596; La Clementina, Tamaulipas. Enlarged.

FIG. 3. *Bufo gemmifer* sp. nov. Type. EHT-HMS, No. 18509; La Venta Guerrero.

FIG. 3a. Same. Ventral view of hand. Enlarged.

FIG. 3b. Same. Ventral view of foot. Enlarged.

PLATE LIII



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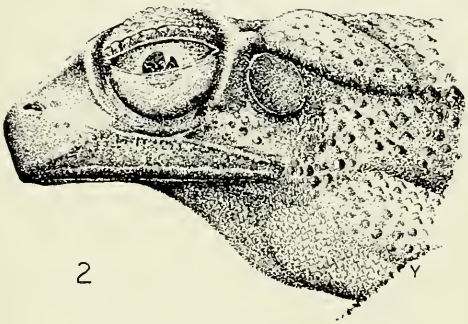

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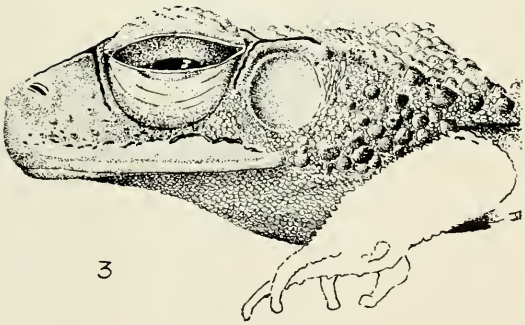

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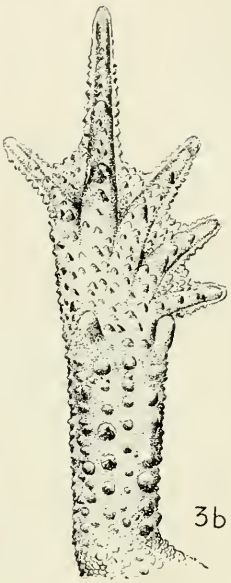


3b

3a

PLATE LIV

Bufo mazatlanensis sp. nov. Type. EHT-HMS, No. 374; Mazatlán, Sinaloa.

PLATE LIV

PLATE LV

FIG. 1, 1a, 1b. *Tomodactylus angustidigitorum* sp. nov. Type. EHT-HMS. No. 18640; Quiroga, Michoacán.

FIG. 2, 2a, 2b. *Tomodactylus macrotympanum* sp. nov. Type. EHT-HMS. No. 6858; South of Jacala, Hidalgo.

PLATE LV

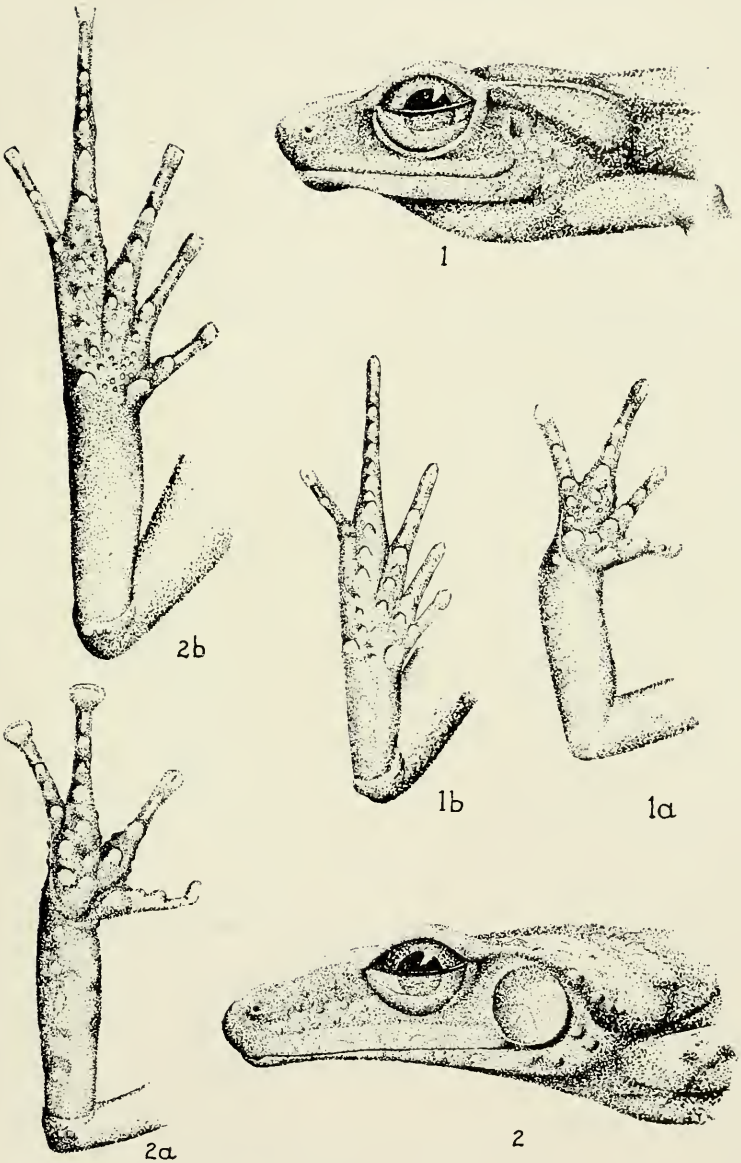


PLATE LVI

FIG. A. *Microbatrachylus albolabris* sp. nov. Paratypes. EHT-HMS, No. 6407 A; near Córdoba, Veracruz. (14 mm.)

FIG. B. Same. EHT-HMS, No. 6408; Mazatlán, Guerrero. (18 mm.)

FIG. C. *Microbatrachylus minimus* sp. nov. Paratype. EHT-HMS, No. 6411; Agua del Obispo, Guerrero. (14 mm.)

FIG. D. Same Type. EHT-HMS, No. 6416; Agua del Obispo, Guerrero. (15 mm.)

PLATE LVI

PLATE LVII

Hyla melanonima sp. nov. Type. EHT-HMS. No. 21578; seven miles east of Chilpancingo, Guerrero.

PLATE LVII

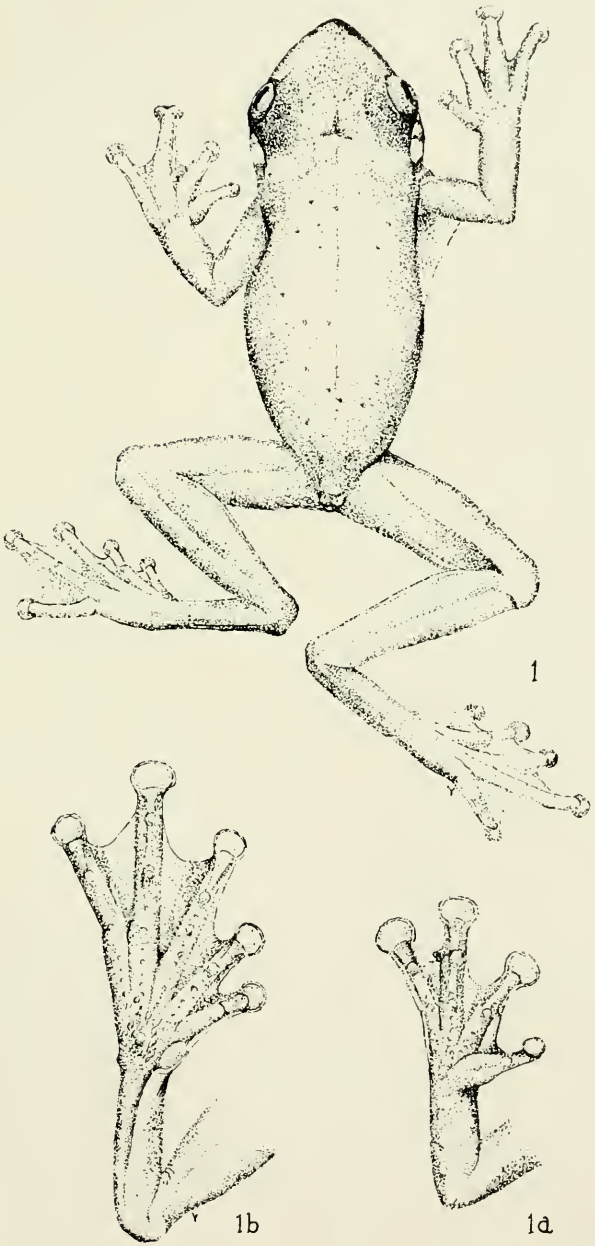


PLATE LVIII

Hyla forbesi sp. nov. Type. EHT-HMS, No. 22276; near Acultzingo, Veracruz.

PLATE LVIII

36—2181

PLATE LIX

Hypopachus cuneus nigroreticulatus subsp. nov. Type and paratypes. About natural size.

FIG. A. Type, ♀, EHT-HMS, No. 12605. Encarnación, Campeche.
FIG. B. Paratype, ♂, EHT-HMS, No. 12652. Topotype.
FIG. C. Paratype, ♀, EHT-HMS, No. 12650. Topotype.
FIG. D. Paratype, ♀, EHT-HMS, No. 12656. Topotype.
FIG. E. Paratype, ♀, EHT-HMS, No. 12655. Topotype.

PLATE LIX

PLATE LX

Hypopachus alboventer sp. nov. Paratypes. Dorsal and ventral views. (About natural size.)

Fig. 1, 1a. EHT-HMS, No. 6552, Huajintlán, Morelos.
Fig. 2, 2a. EHT-HMS, No. 6553, Huajintlán, Morelos.
Fig. 3, 3a. EHT-HMS, No. 6554, Huajintlán, Morelos.

PLATE LX

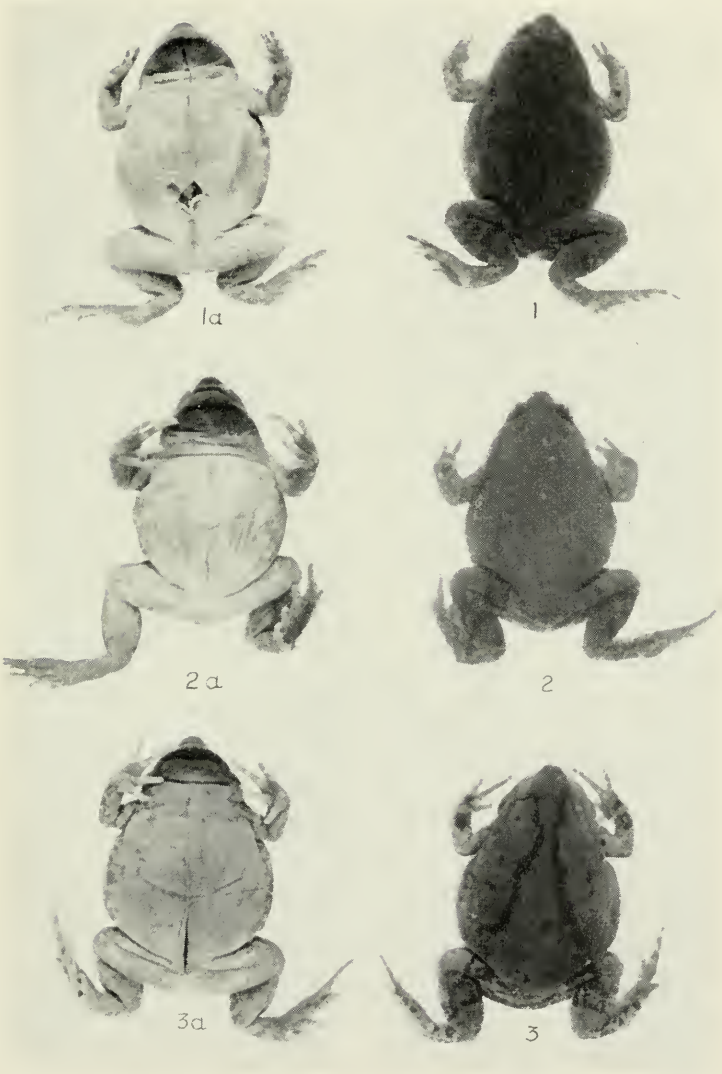


PLATE LXI

Hypopachus caprimimus sp. nov. Paratypes.

FIG. A. EHT-HMS, No. 6560; Agua del Obispo, near Rincón, Guerrero. (Length, 48 mm.)

FIG. B. EHT-HMS, No. 6562; Agua del Obispo, near Rincón, Guerrero. (Length, 42 mm.)

PLATE LXI

PLATE LXII

FIG. A. *Hypopachus cuneus cuneus* Cope. EHT-HMS, No. 1095; Forlon, Tamaulipas.

FIG. B. Same. EHT-HMS, No. 1096; Forlon, Tamaulipas.

FIG. C. *Hypopachus ovis* sp. nov. Paratype. EHT-HMS, No. 1041; Tepic, Nayarit.

FIG. D. Same. EHT-HMS, No. 1046; Tepic, Nayarit.

FIG. E. *Hypopachus maculatus*, sp. nov. Paratype. EHT-HMS, No. 1018; Asunción, Chiapas.

FIG. F. Same. EHT-HMS, No. 1017; Asunción, Chiapas.

PLATE LXII

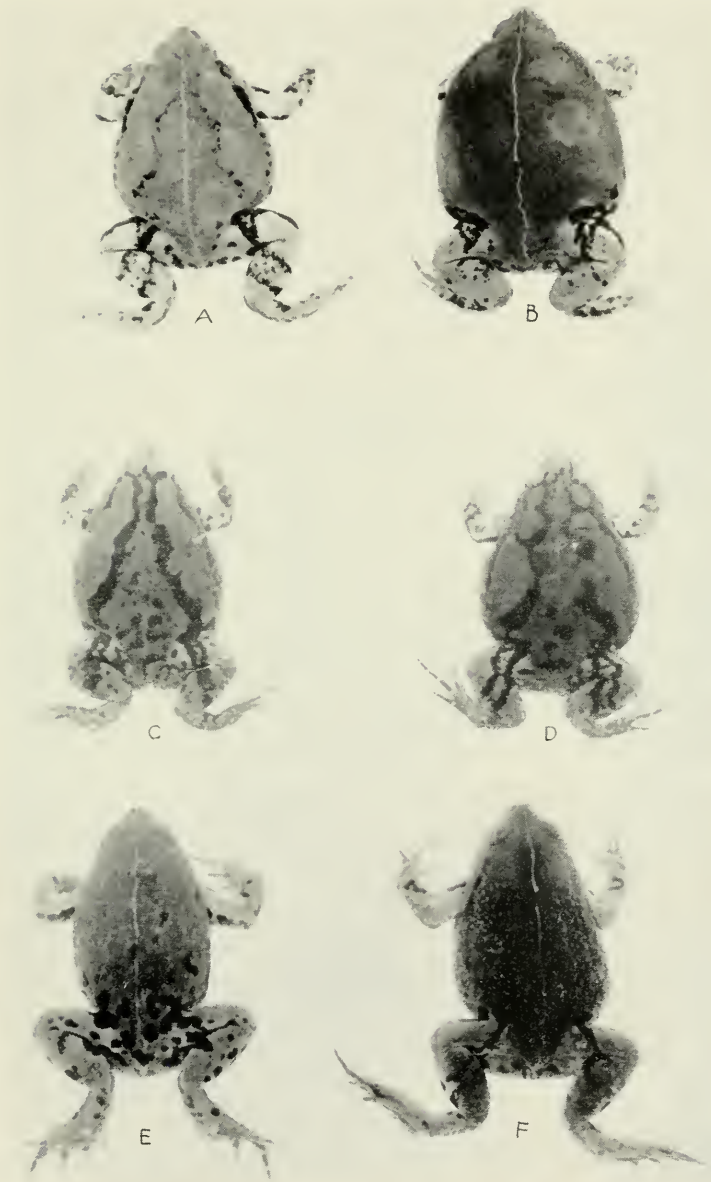


PLATE LXIII

FIG. 1, 1a. *Hypopachus caprimimus* sp. nov. Paratype. EHT-HMS, No. 6556: Agua del Obispo, Guerrero.

FIG. 2, 2a. *Hypopachus maculatus* sp. nov. Paratype. EHT-HMS, No. 1016; Asunción Chiapas.

FIG. 3, 3a. *Hypopachus alboventer* sp. nov. Paratype. EHT-HMS, No. 6553; Huajintlán, Morelos.

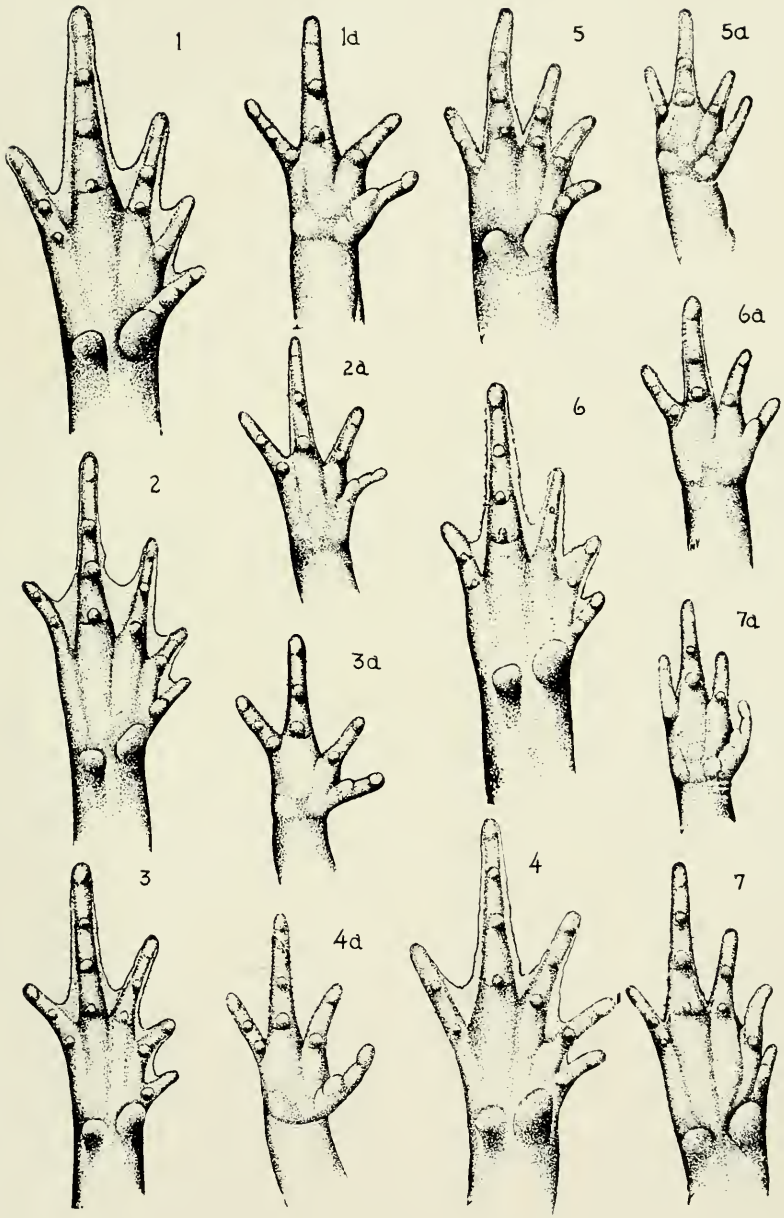
FIG. 4, 4a. *Hypopachus cuneus* var. EHT-HMS, No. 1031; Encero, Veracruz.

FIG. 5, 5a. *Hypopachus ovis* sp. nov. Paratype. EHT-HMS, 1071; Tepic, Nayarit.

FIG. 6, 6a. *Hypopachus oxyrhinus?* EHT-HMS, No. 986; Zapotiltic, Jalisco.

FIG. 7, 7a. *Hypopachus cuneus cuneus* Cope. EHT-HMS, No. 1032; Rio Grande City, Texas.

PLATE LXIII



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